American Machinist

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Clamping with Cams

Jacob Decker
United States Rubber Company

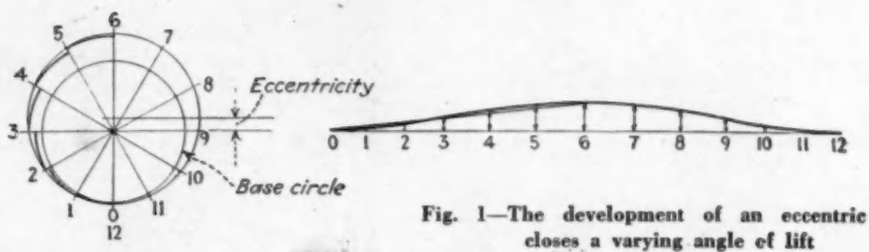

Fig. 1—The development of an eccentric discloses a varying angle of lift

BECAUSE of its simplicity and ease of construction, the eccentric is the most common form of cam clamp. An investigation shows, however, that this particular cam profile lacks the fundamental features of proper design and has many weak points. Since its throw is often determined in a hit or miss fashion, it has brought all cam clamps into disfavor. This is to be regretted because basically, the cam is a valuable element of design, being especially useful for binding machine members and clamping work in fixtures.

The usual type of eccentric clamp is shown in Fig. 1. The developed view illustrates the cam action which in this instance operates at an angle of from 0 to 6 deg. Since the cam must be self-locking, this change in angularity is undesirable. A cam clamp should be at least as efficient as a screw in action as this is usually the alternate choice of design. A screw has a constant angle, which may be selected small enough to insure self-locking, and the cam should also embody these advantages.

What angle must be chosen to guarantee effective clamping action? To answer this we must consider the conditions under which the clamp is operated, such as:

1. Unit pressure on line of contact.
2. Character of the mating surfaces—hardness, and smoothness.
3. Lubrication—oil, coolant, or dry.
4. Amount of vibration.

Tests have shown that the coefficient of hardened and ground surfaces is about 0.1 which corresponds to a friction angle of about 6 deg. However, to insure self-locking, the cam angle must be less than this, especially where much oil or coolant is used or the vibration is excessive. Experience has proved that an angle of 3 deg. is appropriate under these conditions. An angle of 4 deg. may suffice when the cam surface is only slightly oily and the vibration is slight. An eccentric is not efficient because the cam angle may be too great as at point 3, Fig. 1, and the clamp will not be self-locking. This type of cam may also be turned beyond the clamping limit because of the small angle at the point where its clamping action is most effective.

The following method of design recognizes that a constant angle is the basis of proper design. It should be remembered that a clamping cam does not necessarily

follow a motion cam in design as might superficially be thought the case. Time may be neglected inasmuch as it is not necessary to obtain a certain clamping movement in a given interval. For a motion cam, time is an important element, whereas for a cam clamp, a constant angle is essential regardless of the relation of time to angular and clamping movements.

The geometric curve which will meet this condition is a logarithmic spiral. Since the construction of a true spiral is a tedious operation, the method described may be used to obtain an empirical approximation which is

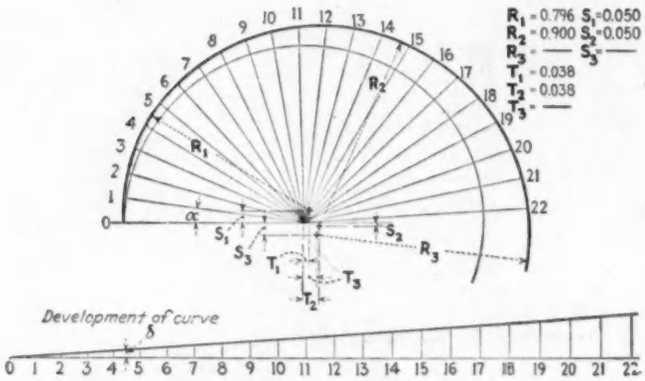

Fig. 3—Suitable radii may be determined graphically to simplify the layout of the cam

accurate enough to produce an effective clamp. Referring to Fig. 2:

R = base radius
δ = friction angle
α = vector angle
x = increment in radius

Angle δ is assumed according to the conditions given in b, c, and d, above. Then the number of divisions into which the base circle is divided is:

$$N = \frac{360}{\alpha} = \frac{180}{\delta}$$

Few clamps use a greater angular range than 180 deg., therefore, this range is assumed to be sufficient for the present consideration. In Fig. 2., distance AC is always at right angles to the radii. Hence:

$$R + x = \frac{R}{\cos \alpha}$$

$$x = R \frac{1}{\cos \alpha} - 1$$

The increment x increases with each consecutive ray since:

Ray No. 1 = $R + x$
Ray No. 2 = $R + x + x_1$
Ray No. 3 = $R + x + x_1 + x_2$, etc.

The ratio of progression = $p = \dfrac{R + x}{R}$

Substituting the value of x:

$$p = \frac{R + R\left(\frac{1}{\cos \alpha} - 1\right)}{R}$$

$$= \frac{1}{\cos \alpha} = \frac{1}{\cos 2\,\delta}$$

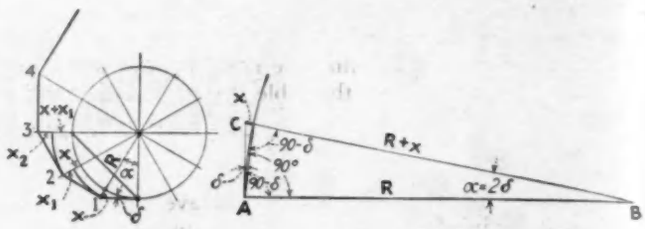

Fig. 2—A spiral giving a constant friction angle may be constructed empirically

To obtain the points 1, 2, 3, 4, 5, etc., the first term of the progression is R, the second Rp, the third Rp^2, the fourth Rp^3 and the last Rp^{n-1} or $Rp\left(\frac{360}{\alpha} - 1\right)$

Fig. 3 shows a cam laid out for the values $\alpha = 8$ deg. and $\delta = 4$ deg. with its development which is a straight line. Circular arcs may be substituted for the curvature of the cam by making the layout with a base circle five or six times its actual size and employing the method of trial and error.

Table I

	δ = 3 Degrees; P = 1.0055				δ = 4 Degrees; P = 1.01			
	$R_o = \frac{3}{4}$	$R_o = 1$	$R_o = 1\frac{1}{2}$	$R_o = 2$	$R_o = \frac{3}{4}$	$R_o = 1$	$R_o = 1\frac{1}{2}$	$R_o = 2$
R_1	0.796	1.050	1.570	2.090	0.800	1.070	1.600	2.125
R_2	0.900	1.130	1.690	2.270	0.890	1.210	1.770	2.090
R_3	.....	.....	.....	.....	.....	.....	.....	2.460
S_1	0.050	0.038	0.064	0.086	0.038	0.060	0.088	0.120
S_2	0.050	0.038	0.056	0.086	0.056	0.084	0.092	0.050
S_3	.....	.....	.....	.....	.....	.....	.....	0 158
T_1	0.038	0.050	0.075	0.085	0.046	0.064	0.096	0.106
T_2	0.038	0.050	0.075	0.086	0.050	0.043	0.100	0.168
T_3	.....	.....	.....	.....	.....	.....	.....	0.038

Table I, to be used in connection with Fig. 3, is for convenient use in drafting rooms. It gives the coordinates of circular arcs to be used for cams with friction angles of 3 and 4 deg. and base circles of $\frac{3}{4}$, 1, $1\frac{1}{2}$, and 2 in.

Fig. 4 shows two common applications of this type of clamp, one for use on a fixture and the other on a machine for clamp-quills, slides, arms, arbors, etc. The flats on the cams may be made larger than shown where greater starting movement is desired to facilitate loading or unloading a fixture. On machine clamps, this is seldom necessary. Adjustments should be provided to compensate for wear or to obtain the desired lever setting. Where cams of this type are widely used, milling

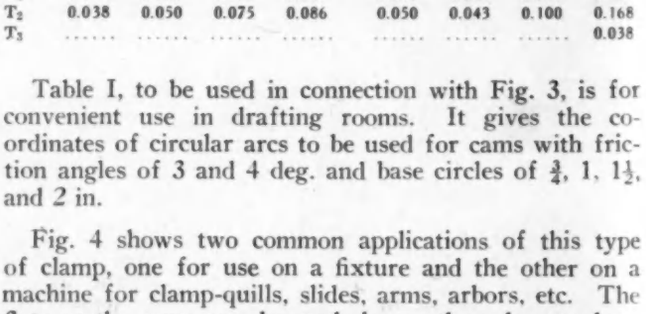

Fig. 4—Cam clamp adaptations illustrating the advantages of a spiral cam surface

cutters may be made for machining the cam curve according to the various radii. In such cases, it is desirable to standardize on a certain base radius.

Cams not included in the table can be readily laid out on a large scale as described and the corresponding radii determined. This method will obtain safe and efficient clamping at all times.

Machine and tool designers often have favorite methods of obtaining certain objectives, usually based on successful experience with their preferred solution or adverse experience with another. This attitude, while natural, may unnecessarily limit the designer's selection of machine elements and unduly restrict his choice. When his prejudice is founded upon misapplication or poor design rather than upon any inherent weakness in the principle, such limitation is particularly unfortunate. A careful analysis similar to the foregoing will usually aid in the most advantageous application.

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Comments on Vol. 72, No. 14

WILLIAM BRYCE
Sheffield, England

THE "Origin and Development" of the American Society of Mechanical Engineers, as told by various past presidents, records progress all along. The outstanding feature is the part taken by *American Machinist*. There has been, from the first, close connection between the two, and they have been mutually helpful.

The "Role of Engineering Education" is shown to be greater than is realized by practical workers. A continual stream of specially educated young men is absorbed into the industry, the effect of which will soon become noticeable. Practical men are inclined to view education contemptuously. I can foretell that within twenty years employers will have a fund whereby the more intelligent young fellows from workshops will be selected for college training, with a view to higher service.

In the article "Molding Industrial Opinion," I was especially impressed by the paragraph on the part played by the press. It showed the tendency to encourage practical workers to have their say. This, by the way is especially noticeable in *American Machinist*, where several pages are devoted to their contributions. While the more educational and advanced matter has its full place, practical men are not ignored.

The impressive feature in "Societies and Associations" was the statement concerning small profits of machinery manufacturers, compared with rougher classes of engineering. This is regrettable, for where great ingenuity and precision are more and more in demand, a good margin of profit should be assured. Either firms are absurdly cutting each other's throats, or there is something wrong with the costs and sales departments.

Concerning "Auguries of the Future," these are truly astounding, and read like exaggerated dreams. Yet they are hardly more wonderful than actual attainments during the past half century. Finality is by no means reached. The writer presumes to add a minor augury to those of Mr. Condit; namely, within a few years jigs and other accurate work will be drilled to fine limits without lost time marking out. They will merely be set in position; then guides for drills, and micrometer adjustments will make positioning and spacing simple.

[Mr. Bryce apparently is not familiar with the extent to which jig borers are in use.—*Editor.*]

SEEN AND HEARD

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Forced Lubrication

LUBRICATION of machines of all kinds is receiving more and more attention, which is as it should be. But it is hardly wise for the customer to specify the particular kind of lubricating system to be used, without consulting the builder of the machine. Milling machines and boring mills might, for example, employ methods of lubrication that would not work out well on high-speed grinding, drilling, or woodworking machines. Flooded lubrication for gears and shafts in the base or column of a machine is excellent where it can be used. Vertical spindle machines can seldom be lubricated in this manner. With a high-speed spindle or shaft, the oil-slinger, or flange, that throws surplus oil off the shaft near a bearing, works out well, as in automobile crankshafts. On a slow or moderate speed shaft however the oil-slinger is of little value.

Some of the most modern machines combine oil pump lubrication with grease lubrication for certain bearings. Others use a continuous pump for certain parts and a hand pump for others. Still others advocate oil from a central pump system with a metering device at each bearing. There is the frequent question of over-lubricating high speed ball bearings with consequent heating and trouble. Generally speaking, however, anti-friction bearings should reduce the lubrication problem for such places as spindle noses which require comparatively little oil and so avoid the trouble caused by excess oil working out of bearings.

Transporting Customers by Plane

THE majority of us like to see a used machine before we buy it, to have a chance to examine it thoroughly. We all fool ourselves more or less as to our ability to size it up by looking it over, but we feel better for having given it the once over, even if it falls down on the job the next week. A leading Chicago dealer in used machinery has taken advantage of this desire and has inaugurated a fast airplane for bringing customers from Cleveland, Detroit, etc., to see whatever machines they are interested in and sending them home the same way. This assures the customer that the machines will bear inspection, gives them an air ride in a modern plane, and conserves time for all. This enterprising method of merchandising should start machine tool builders thinking.

Licenses for Managers

SMALL shops and small businesses of any kind are quite frequently a menace, not so much because they are small but because they are very likely to be poorly managed. Poor management means low wages and taking work below a legitimate price; these tend to demoralize business in any locality. Good management is just as important as good workmanship, perhaps even more so. We now license engineers, plumbers, and electricians in some states, based on their mechanical knowledge. It might be even more to the point to license managers, and only when they understand the principles and practice of good management. —*J. R. G.*

NEW BOOKS

THE UNIVERSE AROUND US.—*By Sir James Jeans. 340 pages, 5¾x8½ in. Cloth boards. Illustrated. Indexed. Published by the Macmillan Company, New York, N. Y. Price $4.50.*

"Just as a bell that is struck with a hammer emits a characteristic tone, so every atom put in a flame . . . emits a characteristic light." Thus does the author initiate the layman into spectroscopy. By similar comparisons with familiar things he leads the reader through various theories concerning the mysteries of the atom, of astronomy, of relativity, the beginnings and endings of stars and worlds. Though every word is scientifically authoritative, the book is not weighted down by highly technical language; read with some care, it is well within the capacity of the average reader.

As such, it will give any executive and operator in the metal working industry a broader view of the world in which he lives and works. And he can well be proud of the part that his industry has played in producing the fine machinery that made possible the measurements, analyses, and discoveries reported in Sir James' work.

PRINCIPLES OF ELECTROPLATING AND ELECTROFORMING.—*By William Blum and George B. Hogaboom, chemist and electroplating advisor, respectively, of the U. S. Bureau of Standards. Second edition. 424 pages, 6x9 in. Indexed. Cloth boards. Published by the McGraw-Hill Book Co., Inc., 370 Seventh Ave., New York, N. Y. Price $4.50.*

So many changes have taken place and so much progress has been made in the plating industry since the publishing of the first edition six years ago that the authors have prepared this second edition to promote a fuller understanding and correlation of the principles and practice of electroplating. One important addition is a chapter on chromium plating.

Among the chapters in the book are those on the following subjects: Principles of chemistry; principles of electrochemistry, factors governing the character of the deposits; selection, specification, and inspection of electrodeposits; preparation for electroplating and electroforming (electrotyping); deposition of copper, nickel, cobalt, iron, chromium, zinc, cadmium, lead, tin, and precious metals. The purpose of the book is to put the art on a scientific basis and to acquaint technicians with scientific principles and progress.

AMERICA LOOKS ABROAD.—*By Paul M. Mazur. 299 pages, 5½x8½ in. Cloth boards. Published by The Viking Press, New York, N. Y. Price $3.00.*

Mr. Mazur's initial book, "American Prosperity," attracted very wide attention, not only because of its grasp of the economic situation of today, but equally because of its readability. This volume is quite up to the standard set by its predecessor. This reviewer liked it, possibly because the analysis of European economic problems and of international trade agreed in its essentials with his own views.

The author does not hesitate to paint a gloomy picture of what may happen if Europe and the United States are drawn into a tariff war. In this war as in modern military conflicts no winner can emerge from the struggle. What he says about an economically united Europe is given added point by M. Briand's latest program for a European Union.

American tariff diehards will find little consolation in what Mr. Mazur has to say. He takes as his thesis the inevitability of an import trade balance for the United States, and develops it in detail. In so doing he points out that an import balance of a half billion dollars is not nearly so terrifying if the total volume of world trade is increased by several billions, as is inevitable eventually, and in the near future if American ideas of stimulated distribution backed by mass production are accepted by the Old World.

No business man or manufacturer can afford to be guided by tradition or opinion in this day of international commerce. He must have facts and he must study them as he has never studied before. Mr. Mazur's book should prove an excellent introduction to the new economics of world trade.

INDUSTRIAL ACCOUNTING FOR EXECUTIVES.—*By John R. Bangs, Jr., assistant professor of industrial engineering, Cornell University. 449 pages, 5¾x9 in. Indexed. Published by McGraw-Hill Book Co., Inc., 370 Seventh Ave., New York, N. Y. Price $5.00.*

On the premise that a good knowledge of accounting has become an important requirement for administrative training, this volume gives a thorough-going presentation of the theory and practice of this subject. While primarily intended as a textbook for engineering students, and in fact based on mimeographed sheets used in a university course, it should be of interest to many industrial executives.

In true engineering style, Professor Bangs analyzes methods as he discloses them, discussing alternate views on debatable points, and outside opinions in support or denial of these views. His chapter on "Controversial and Debatable Accounting" exemplifies this form of approach.

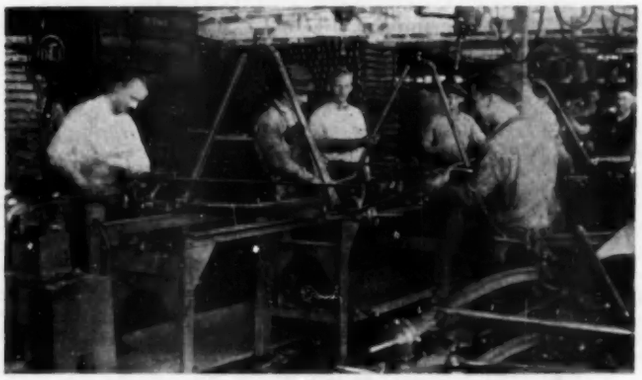
The author has succeeded in creating a complete introduction to industrial accounting without confining himself to a purely elementary treatment. This he accomplishes through a nice sense of proportion resulting in an exceptionally well-balanced work. Although he presupposes in his reader an ability to digest technical data, he does not expect his reader to have previous familiarity with the subject at hand.

In those chapters on the mechanics of accounting and those more specifically dealing with industrial cost applications, the illustrations of forms and entry sheets are supplemented by diagrammatic charts. A brief but comprehensive outline of the fundamentals of actuarial science is included. The chapter on "Depreciation, Obsolescence, Inadequacy, and Depletion," which distinguishes these terms and defines them in the light of existing income tax laws, is worthy of special note. Stress is placed on the analysis of financial statements by the use of standard ratios as yardsticks of business condition. The volume concludes with a description of modern bookkeeping machines and their efficacy to minimize accounting costs.

One Ford a Minute

Off the Assembly Line

HERBERT CHASE
Associate Editor

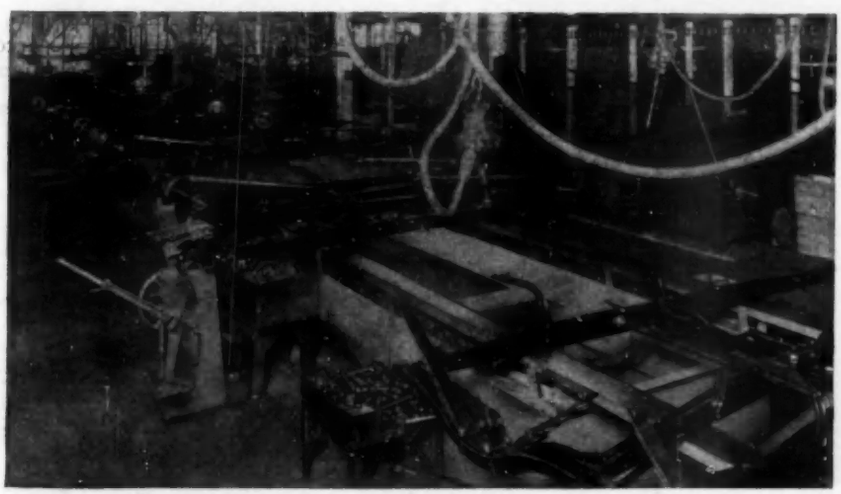


Front axle units are assembled on this "dead-line," the parts being taken from adjacent stacks. The assemblies are slid along by hand as parts are added

AS EXPLAINED in foregoing articles covering the activities at the Ford assembly plant in Chester, Pennsylvania, parts are shipped in daily in approximately the quantities required for the particular day's operations. Chassis parts and complete units, such as engines and rear axles, received ready assembled, are taken from cars spotted on a freight siding which runs the length of the assembly building and are either stacked or hung upon conveyors between the siding and the chassis assembly line, at such points as to be most convenient to the latter, so as to minimize handling.

The chassis-assembly line has been developed for continuous operation, and is supplied with units from various feed-in lines. Front axle units are assembled on a "dead-line," or a stationary framework without conveyor rollers, along which the workmen slide the units between operations. This dead-line is 35 ft. long. The assembly is built up by adding the front-wheel spindles, bearings, steering arms, radius rods, and front spring to the front axle, and then lining up the unit in a fixture.

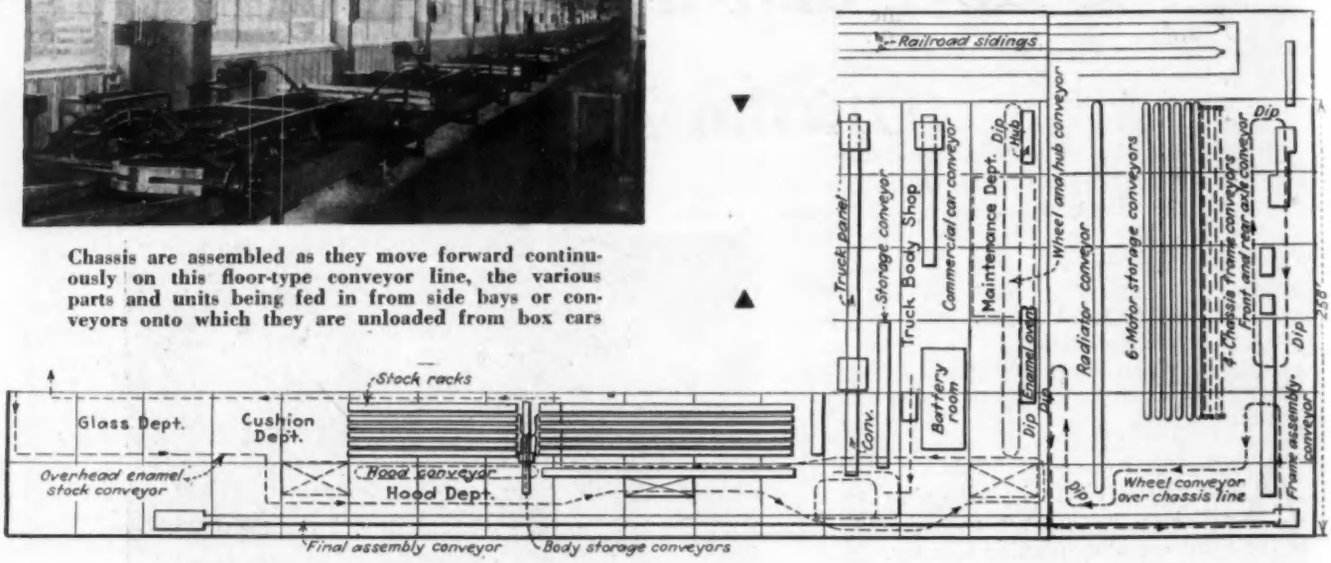
Rear axle units, including the drive shaft and torque tube, arrive at the plant assembled. Radius rods are added on a dead-line conveyor. The front and rear axle units and the rear springs are then hung, one of each in a group, on the hooks of an overhead chain conveyor, are cleaned, and then are carried through a booth where they are spray-painted. The conveyor then carries these parts down to the first part of the chassis-assembly line, which is a floor-type chain conveyor.



Springs and axle units are assembled to the chassis frame as it travels in inverted position along this line. A jack for compressing the spring while shackle bolts are attached is shown in the foreground

Chassis frames arrive at the plant assembled, except for the four step irons, which are riveted on in four heavy presses, especially designed for this work. Each press drives three rivets simultaneously. The frames are then put on a conveyor and shock absorber parts are attached first. Then rear axles and rear springs are removed from the overhead conveyor line leading from the spray booth and are attached. A machine compresses the rear spring enough to permit the shackle bolts to be inserted. The chain conveyor from the spray-booth loops across the chassis conveyor and, as it returns up the opposite side, front axles are removed and installed on the frame at points opposite the rear axle station. The chassis proceeds along the conveyor, on which at successive stations, brake assemblies are installed, front bum-

Chassis are assembled as they move forward continuously on this floor-type conveyor line, the various parts and units being fed in from side bays or conveyors onto which they are unloaded from box cars



Chassis and body parts unloaded at railway siding docks are fed by conveyors through various subassembly and finishing departments toward the conveyor upon which the final assembly is completed

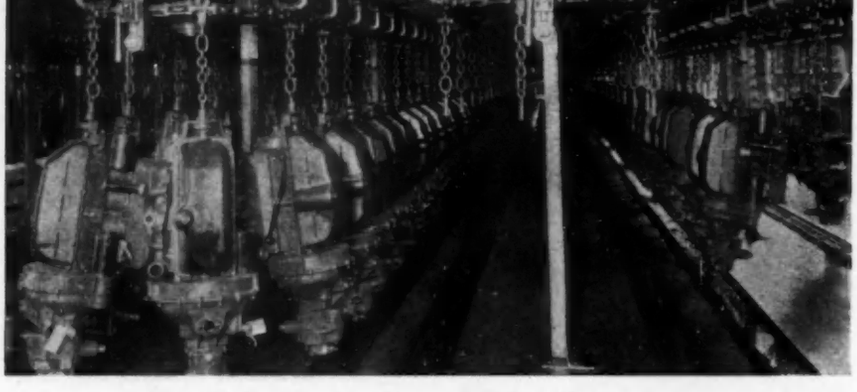
pers are mounted, brake rods are attached, hubs are put on, and the rear end is filled with grease from an overhead tank, which, together with the pipe line, is steam-jacketed to keep the grease fluid.

When chassis reach the end of the conveyor line they are lifted by an air hoist, turned right side up and placed lengthwise on the final chassis and car-assembly conveyor. This conveyor is of the chain type, carried on floor stands and is 620 ft. long. Cars are assembled on 14½-ft. centers.

At the beginning of this assembly line rear bumpers are attached. Brake rods then are installed. The next operation on the final car-assembly line is the insertion of the engine. There are six overhead chain conveyors carrying engines from box cars to the assembly lines adjoining the final-assembly conveyor. These chain conveyors carry 190 engines each, hence a total of 1,140 can be held in live storage. There are two 30-ft. lines accommodating twelve engines at a time, on which various parts are attached to engines. To the engine are added distributors, spark plugs, gear-shift levers, brake levers, and brake and clutch pedals. Oil is put into the crankcase and grease into various bearings. Engines then are delivered, by electric hoists traveling on overhead I-beam tracks, to the car-assembly line and are mounted in the chassis.

Steering - gear - column subassemblies are made up on steel tables adjoining the final-assembly line and are installed after the engines are in place. Radiators are put on next. They arrive in box cars and are unloaded and trucked to a test room where they are examined under pressure for leaks. The cores are spray-painted, hung upon an overhead chain-conveyor line and sent to the final assembly line where they are mounted upon the chassis.

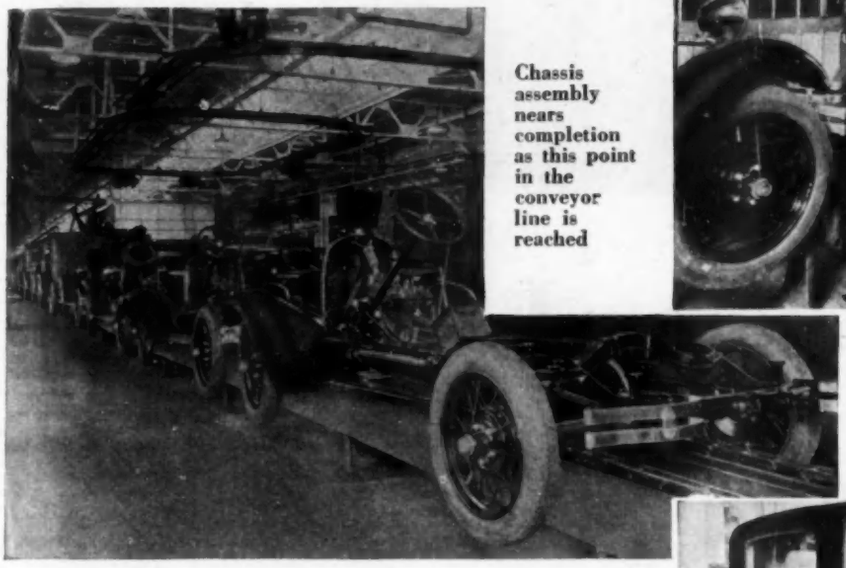
Tires and tubes unloaded from box cars are delivered to benches near the final assembly line. To this point are brought wheels from the enameling oven. Tubes are received in the tires. Tires are mounted upon the wheels, the tubes are inflated, and the completed assemblies are delivered by conveyors to the chassis-line station where they are mounted upon the wheel hubs. The latter also are delivered to the chassis line by a chain conveyor.



Assembled engines are hung upon these chain conveyors as they are unloaded from freight cars and are carried by the conveyors directly to the point at which the engine is assembled in the chassis

Batteries, received at the plant in carload lots, are unloaded at a station located opposite to the point of feeding into the car-assembly line. Here, in a room 50x50 ft., 520 batteries a day are charged. There is capacity for 728 batteries on the line at once. The minimum storage carried is about 1,000 or 1,200 batteries. Stocks of acid and distilled water also are maintained in this department. Batteries now are received dry-charged. They remain on the line only 20 hours under 4½ amp. to bring them up to full charge, whereas, without the dry charges, the requirements were 96 hours under 6 amperes.

Front fenders and running-board splash aprons are built into sub-assemblies on bucks adjacent to the car-assembly line. After these parts are mounted on the frame on anti-squeak pads, the chassis have reached the point where the bodies are installed. A period of only 45 min. elapses from the time the rear springs are put upon the rear axle assembly until the chassis assembly reaches the point where the body is mounted. From this point on the conveyor is known as a build-up line.

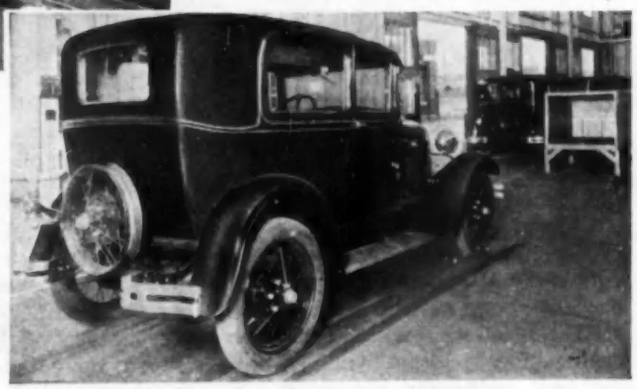


Chassis assembly nears completion as this point in the conveyor line is reached

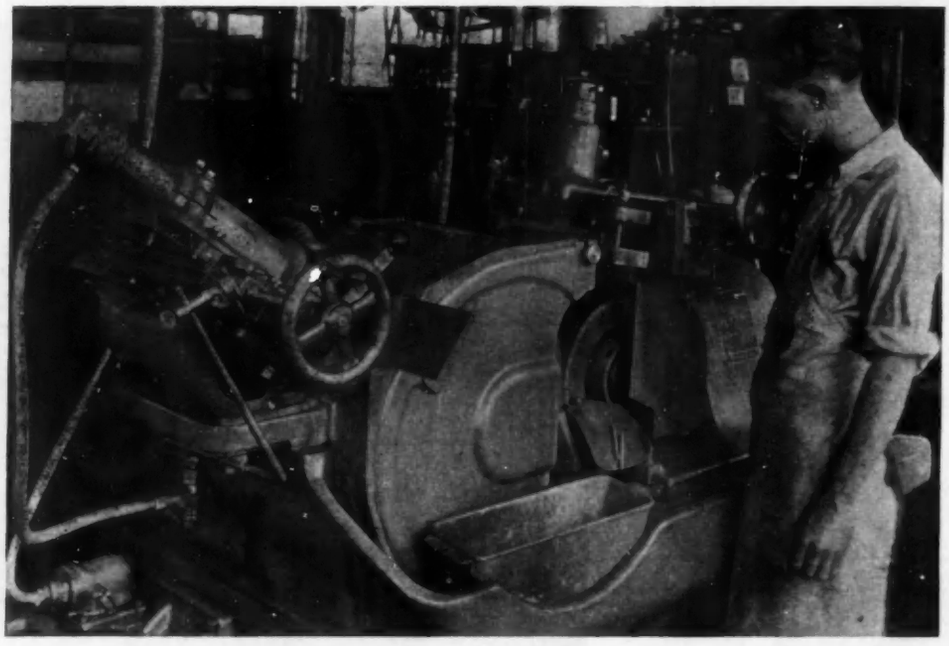
As explained in earlier articles, the bodies are assembled, finished, and trimmed on conveyor lines feeding toward the chassis assembly line. Finished bodies are stored temporarily on floor-type slat conveyors from which they are transferred to a short line ending at the chassis assembly line. Here each body, with rear fenders attached, is raised successively by a power hoist hanging from an overhead rail and is lowered upon the chassis. Body bolts then are put in and tightened. Seat cushions then are delivered to the line and placed in the cars. Finished hoods are installed and various hardware items, lamps, and other external parts are added to complete the cars, which then are ready for testing. Gasoline is put in the tanks at two stations because the cars travel on the conveyor too fast to get 11 gal. in at one point. Finally, engines are started and adjusted, the cars receive a final polishing, drivers get into the cars and run them off of the assembly line onto a front-wheel alignment tester.

This device consists of two sections constructed of wood, one for each front wheel to travel over, at floor level, and pivoted beneath to move as guided by the wheels. An arrow at the front end of each section lines up with the center of a graduation on the floor if the wheels toe-in correctly, and indicates the adjustment necessary if they do not. At the same time the headlights are turned on, and, by means of a gage stick and a screen 25 ft. away, upon which the lights are directed, correct focusing is secured. A final inspection is then given each car, after which it is run out of the building, and turned over to the car-delivery department. Storage for only 60 cars or about one hour's production is provided here, hence the cars have to be moved out quickly. Dealers are notified the day before cars are completed, as to the cars which will be ready for them at certain hours, and are counted upon to send their representatives to get these cars as the cars come in from the short test runs to which they are subjected.

Finished bodies, with rear fenders attached, are lifted by trolley hoists from the temporary storage conveyors at the end of the body line, swung over and dropped upon chassis



When finished cars reach the end of the assembly line headlights are focused and adjusted to limits on the screen shown, after which the car is run off the line under its own power



A review of recent developments in cylindrical grinding and of the resulting economies

Closer Limits at Lower Costs

R. E. W. Harrison
Chief Engineer, Cincinnati Grinders Incorporated

THE PROGRESS made in the development of new machines and new methods for precision cylindrical grinding in the past year and one-half has been emphasized by a wider application of grinding and polishing to the thousand services that support the present mechanical age. Since the manufacturing success in the engineering industry is dependent upon accuracy of product, rate of output, and quality of finish, these factors have influenced improvements in machine tool design. Especially has this been true among builders of grinding machinery.

Just how this progress has been made by one manufacturer, Cincinnati Grinders Incorporated, is graphically shown in three charts. Although the curves are representative of an average of all industries served by precision grinding machines, they illustrate an improved relationship between the accuracy cost, output cost, and quality cost.

Considering first the accuracy-cost diagram, Chart 1, it is realized by all who are concerned with uniform accuracy of product that manufacturing costs are almost directly proportionate to the imposed limits; hence users have always a ready ear for methods of operation which facilitate accurate sizing by comparatively unskilled labor. As many of our cheapest products in general use today are manufactured to the closest limits of accuracy, there is evidence of an unbreakable link between the final cost of a product and the efficiency of the manufacturing accuracy control.

Much time, money, and thought have been put into the study of automatic sizing facilities applicable to precision grinding machines, and one result of this experimental work is the development of a centerless grinding machine equipped with automatic sizing control. The mechanism consists primarily of a finger, so pivoted that it drags on the work as it travels through the machine. When, owing to the wear of the grinding wheel, the work commences to be ground oversize, it exerts a drag on the sizing finger, which immediately sets in motion a wheel-wear compensating mechanism accurately restoring the throat dimension of the machine. Piston pins ground on centerless grinders to limits of plus 0.0002 minus 0 in. can now be produced automatically in this way. This represents a marked advance in the production of work to these limits of accuracy, as compared with the facilities available in 1928. It is safe to say that sizing control under manufacturing conditions has improved in efficiency to the point where we can now size from 0 to

CHART I

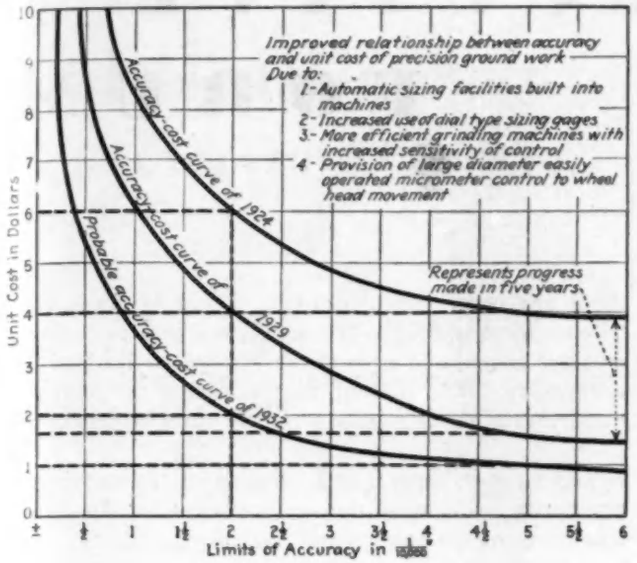

Improved relationship between accuracy and unit cost of precision ground work
Due to:
1- Automatic sizing facilities built into machines
2- Increased use of dial type sizing gages
3- More efficient grinding machines with increased sensitivity of control
4- Provision of large diameter easily operated micrometer control to wheel head movement
Accuracy-cost curve of 1924
Accuracy-cost curve of 1929
Probable accuracy-cost curve of 1932
Represents progress made in five years
Unit Cost in Dollars
Limits of Accuracy in

CHART II

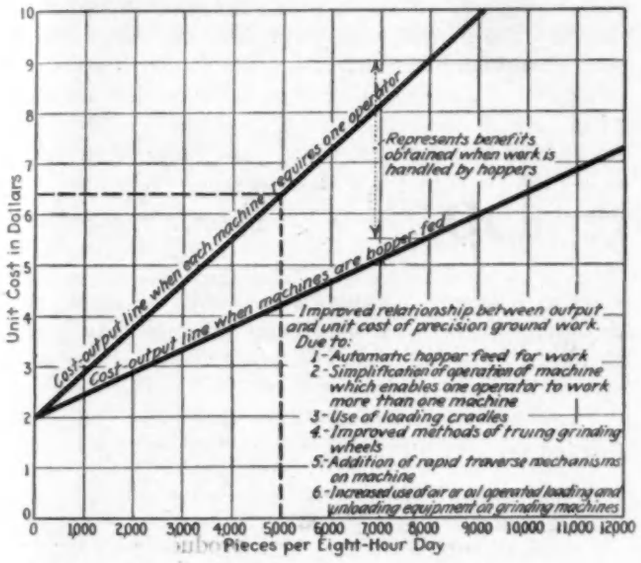
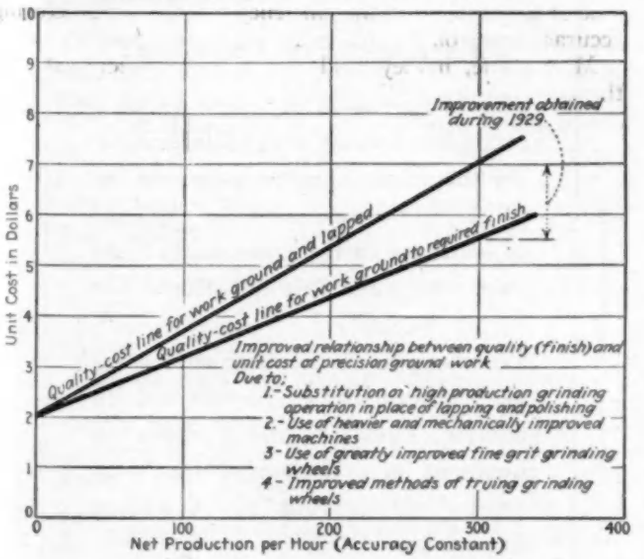

Cost-output line when each machine requires one operator
Cost-output line when machines are hopper fed
Represents benefits obtained when work is handled by hoppers
Improved relationship between output and unit cost of precision ground work.
Due to:
1- Automatic hopper feed for work
2- Simplification of operation of machine which enables one operator to work more than one machine
3- Use of loading cradles
4- Improved methods of truing grinding wheels
5- Addition of rapid traverse mechanisms on machine
6- Increased use of air or oil operated loading and unloading equipment on grinding machines
Unit Cost in Dollars
Pieces per Eight-Hour Day

CHART III


Improvement obtained during 1929
Quality-cost line for work ground and lapped
Quality-cost line for work ground to required finish
Improved relationship between quality (finish) and unit cost of precision ground work
Due to:
1- Substitution of high production grinding operation in place of lapping and polishing
2- Use of heavier and mechanically improved machines
3- Use of greatly improved fine grit grinding wheels
4- Improved methods of truing grinding wheels
Unit Cost in Dollars
Net Production per Hour (Accuracy Constant)

plus 0.0002 in. for the unit cost per piece formerly required by limits of 0 to plus 0.0005 in.

Students of manufacturing methods frequently remark that output measured in tonnage or units of work against man-hours, is constantly increasing, and this is the standard by which our industrial efficiency is judged today. By providing facilities for the users of grinding machines, which enable the output per operator to be doubled or trebled, something materially constructive has been contributed. The application of automatic hopper feed in a thoroughly acceptable way to centerless grinding machines has made possible the progressive increase of output per operator. In addition, users of grinding machines have been provided with a considerable number of air and hydraulically operated loading and unloading equipments, which occasionally have stepped production up to a rate five times as high as that previously attained.

THE relative position of the cost-output lines in Chart 2 indicates graphically the effect on unit cost per piece which these added facilities, all designed to cut idle time to a minimum, produce.

The desire for an enhanced quality of surface has led to the adoption of the rolling, lapping, or polishing methods of finishing cylindrical parts which in service are subjected to intensive wear. While it is possible by these methods to produce highly finished surfaces to a remarkable degree of accuracy, the processes are not automatic either in sizing functions or in respect to the facilities for loading and unloading. The operations call for the use of entirely special machines and entail very close supervision of labor to insure that the desired degree of accuracy and finish is obtained. A study of these conditions has led to the production of a modified form of centerless grinding machine, which produces work automatically to the desired degree of finish and accuracy. The machine is so arranged that it can be satisfactorily operated by comparatively unskilled labor, and the work controlled in size to within plus 0.0002 minus 0 in.

The improved relationship between the old and new methods of finishing a typical piece of work, such as an automobile wristpin, is shown graphically in Chart 3. It will be noted that in each chart, the dollar sign has been used as the ordinate, and rightly so. In the last analysis, all of the technical endeavor for an industry must be reduced to a dollars and cents basis before a case can be proved.

■

Milk as a Coolant for Steel

BY JOHN KOPP

At the plant where I am employed, we purchased a quantity of low-carbon tungsten steel for hot-forging dies. When we came to sink the impressions we found that carbon steel cutters simply would not stand up. We then tried high speed cutters with no better results though we tried lard oil, soda water, turpentine, and different emulsions.

Before rejecting the steel we took the matter up with the maker, who, to our surprise, recommended milk as a coolant or lubricant. We tried it out and found that we could get good results with both carbon and high-speed-steel cutters. Milk is not new as a lubricant on copper, but I had never heard it recommended for steel.

EXECUTIVE FORUM

Wholesale or Retail?

"COME IN, Mr. Perry," said John Boyd, president of the Planet Engine Company. Robert Perry, proprietor of a small electrical and radio shop, was occasionally called to the Boyd home when his services were required. He entered to find John Boyd seated in his well-furnished library.

"Good evening, Mr. Boyd. What can I do for you?" asked Perry.

"Take a look at the radio," said Boyd, indicating a handsome cabinet against the wall. "It seems to have gone dead although it is comparatively new."

"A fine looking outfit," Perry commented. "The same make that I carry."

"It was a birthday present to my daughter last March," Boyd explained. "I bought it through the company—commercial discount, you know."

"Don't think I am saying this because of any personal grievance; but isn't it true that company purchasing power is being abused?"

"I see no particular harm in it," said Boyd. "Our employees find that method of buying a great convenience. When they use the plant purchasing department, they do not need to spend their spare time shopping."

"But there is another side to the question—the effect on the community. Through friends in most of the local industrial plants, I have observed how the practice has grown. From an occasional item, handled by the purchasing agent as a favor, has developed a system of buying for a great variety of personal needs. Company employees now get most everything from furniture to coal in this way. It is pretty hard for the local merchant and tradesman to stay in business."

"Perhaps there is little excuse for me personally," admitted Boyd, "but group buying helps my employees. We save them in discounts many dollars each year—this is equivalent to higher wages. We buy from reliable sources insuring good quality at low prices. This encourages our men to obtain commodities which add to their welfare and that of their families. I would hesitate to condemn any practice which improves their standard of living."

"Taking a short view, it may seem advantageous, but there are other considerations. Local business contributes to prosperity. The small merchant pays taxes, employs clerks, and adds to the business activity of the community. The loss of the patronage of industrial employees in the aggregate seriously hurts his business."

"As I see it, then, it is a question of the merchants' prosperity as against the improvement in the living conditions of our employees," said Boyd.

"Not entirely," Perry replied. "Local business improves property values in which the entire community shares. The merchant employs sons and daughters of your shop men often increasing the family income far in excess of purchase discounts. He renders services which add to the value of the products he sells. For example if you had purchased your radio from me, I would have repaired it without charge. When you cut into the merchant's trade, you decrease his usefulness to the community."

"The company endeavors to serve its employees, though perhaps in a somewhat different way," said Boyd.

"Yes, but when you sell your men tires, where do they go for free air?"

■

What Do You Think About This Executive Problem?

Should an industrial plant go into retail business at wholesale prices? Do the advantages resulting to its employees compensate for the loss of business to the community? Is this practice a fair substitute for higher wages?

Perhaps you are familiar with company buying for employees and its results. Your comments either in approval or criticism of this procedure are invited by *American Machinist*.

. . . Discussion
of Executive Problems

■

Is Incentive Necessary?

It is generally assumed that all persons are ambitious to advance. As a matter of fact, a large majority of people need constant urging of some kind to induce them to exert even a moderate effort in their own behalf. The general realization of the truth of this psychological fact has been largely responsible for the tremendous growth in the use of wage incentives in an effort to reduce manufacturing costs by increasing the employee's application to his job, both mentally and physically.

I do not believe wage incentive plans, as such, deserve as much credit as they have received. A wage incentive plan, at best, is nothing but a mechanism for controlling the output of a plant by the use of recorded standards established by investigation and analysis. Where it is used in an attempted substitution for effective management, it is doomed to failure, for successful use of incentives always compels the management to maintain a high degree of perfection in practically all phases of its activities. For example: machines must be kept in good repair so that the feeds and speeds established as standard can be used at all times; castings must be of good quality and not full of hard spots or blow holes; work must be scheduled and dispatched accurately so that men will not be kept waiting. These things and many other phases of the problem call for far more effective management than is required in a shop working under the daywork plan. This is not to be taken to mean that the same effort on these points in a daywork shop would not bring corresponding benefits, for they would. The fact that wage incentive plans more or less keep the management as well as the worker on its toes is a strong point in their favor.

The chief value of an incentive plan of wage payment is in the fact that the installation of such a plan is a standardizing process, usually carried on by time and motion study engineers. These men devise the best methods of doing work after a searching examination of processes, operations, and operators. These best methods in turn are standardized, recorded, and taught to all of the workers. Such a program cannot be carried out by an inefficient organization.

—W. B. Lincoln, Jr., *Chief Engineer, W. J. Savage Company.*

Pensions or Leaky Payrolls?

There are four ways in which to dispose of an old employee who has begun to slow up: keep him on the same work, give him lighter or slower work, lay him off with a pension, or lay him off without any consideration. The first has been demonstrated as uneconomic; the last is cruel. Either the second or the third plan should be adopted.

In the first place, it is well to make sure that the man has slowed up. Age alone is not a safe guide. The amount of good work turned out by an old man may exceed that produced by a young man although the total production may appear the opposite.

Having determined that a man is not producing efficiently, the problem of choosing between slower work and a pension depends upon the ability of the man. If he has worked faithfully for the company for years, he is at least entitled to a pension. But he may be worth more than that. Have you ever wanted some experimental work done, and found that in the hurry of production, you could not get it just as you wanted it? Older men frequently take a pride in making a piece accurately and carefully. It is often of value to have some of these men busy on something in order to get the benefit of their experience when you need it.

—Harrison G. Brown, *Supervisor of Standards Division, Crompton & Knowles Loom Works.*

Who Should Do the Firing?

The foreman is responsible for the output in his department, and the firing should therefore be left up to him. He knows his men better than the employment manager, and he cannot be expected to run his department efficiently if he is not permitted to make changes wherever he sees fit. Since no foreman wants to discharge men any more than the management is desirous of having them discharged, it is seldom indeed that he will let a man go without good reasons.

Having the employment office check up on men who are discharged is a good plan in that the foreman will do some serious thinking before taking action. It will moreover prevent him from discharging men in a fit of temper.

—W. J. Owens, *Foreman, Newport Rolling Mill.*

Jigs By Whom?

I do not believe this question of the responsibility for jigs and fixtures can ever be settled satisfactorily by placing all the responsibility in either the shop or the engineering department—if ever there is a truly co-operative function, surely this is it. I have observed its workings at different times under the sole control of the shop, and again under the absolute direction of engineering. Neither was wholly satisfactory.

The best solution I have actually seen functioning involves a compromise. The initiative for deciding who shall design a jig or fixture should rest with the shop. If it is of such a simple nature that the shop believes it can handle it without engineering aid it should be allowed to do so; if the design is involved, or for any other reason, the shop wishes engineering in on it, the responsibility then definitely passes to engineering. Even though the design is done in engineering, the shop should be freely consulted, and permitted to express its ideas on the design before it is issued. The really important point is that the final decision rests irrevocably with engineering.

If both engineering and the shop are to co-operate in designing jigs and fixtures, much can be gained by

having the engineering department located close to the shop. Routine contacts are decidedly helpful to both, and aid in fostering the necessary spirit of co-operation, which is after all the most important consideration of all.

—ELI SMITH, *Russell & Company.*

Should Salesmen Design?

Although in practice one rarely finds the custom of allowing salesmen a word in the design of a product, it certainly would save an expenditure of useless time and money if this were done. In the majority of cases, it is found that salesmen have not sufficient knowledge of a technical nature to qualify them as critics of the designer's art, and for this reason the management evidently prefers to place their entire confidence in the designers. This attitude is fallacious, as it is not always a deep knowledge of technical matters that is required. It would appear ridiculous to submit drawings to salesmen, as they are not interested in these, but in the change of function or action that will take place in the product of which they have to dispose.

The practice adopted by the writer is to encourage salesmen to suggest the outline of an alteration or new machine, as by virtue of the fact that they are always in the field, they are really best qualified for the work. They are in a unique position not only to discover what competitors are doing with regard to changes in the product, but what is far more important, they get first-hand information of what a customer wants. Success comes only to manufacturers who supply an article to fulfill this want.

—RONALD L. TANDY,
Newark-on-Trent, England.

Sales or Sincerity?

The principle of the absolutely square deal may lose a skirmish here and there, but it is excellent to win the campaign. Common horse sense and honor go hand in hand. It is, beside being right, essentially sound business to play the game. The straight path in business, the square deal, and the code of fair play—here is a high ideal; but it is quite equally the soundest practical policy. The salesmen, who can be relied upon, may reasonably expect their fair share of the orders available.

It takes time to build up a solid reputation for dependability as well as for quality and price; but it is time very well spent. And fairly won, it is a priceless asset, being an essential element in that good will which is so potent an instrument for insuring success.

—W. R. NEEDHAM,
Stafford, England.

Should Small Shops Co-operate?

I have yet to see the practical mechanic who likes bookkeeping. Yet the small shop owner, who wishes to cut costs in order to keep in the running with his competitor, must have an adequate system of cost accounting. The idea of pooling office resources, where shops are situated in the near vicinity, was used successfully during the war, but under peacetime conditions, was discontinued when competition of a more intense nature made co-operation difficult. Some of the companies solved the problem by merging. In the case under discussion, the same problem of competition presents itself, and the only obvious remedy I see, is for the shop owner either to hire a competent bookkeeper to take care of the books in his spare time, or brush up on his own commercial arithmetic.

I know of several small shop owners who leave the clerical side of the business in the hands of their wives, and in every case they are very efficient hands indeed. Women often suggest economies and cut costs which the mere man would consider too trifling to bother with.

—ROBERT S. ALEXANDER,
Universal Winding Company.

Is the Customer Always Right?

Generally the customer is wrong either because of ignorance, carelessness, or pure malice, but it is poor policy to tell him so right off the bat. Executives are dependent to a large extent on their subordinates for information and quite often are deceived by some one trying to cover up an error. The manufacturer is made the goat and placed in a very delicate position because the misinformed customer is making what he believes to be justifiable demands and will not be satisfied until adjustment has been made or until convinced of the cupidity of some employee.

In far too many cases, the facts will show that the manufacturer is the victim of unscrupulous customers who, because of the "The Customer is Always Right" fad, have discovered that the chronic kicker generally gets better service and more adjustments. The cash customer is seldom a cheater. The cheater prefers to hold a leverage to force his demands and therefore will ask for the longest terms. Many customers become extremely dissatisfied with merchandise which was all O. K. until they developed inability to pay as agreed. In cases of chronic kickers, the best policy is to let your competitors have the business.

—T. HOMER THOMAS, *Vice-President and Manager, Tri-State Warehouse Company.*

Does Reciprocity Pay?

From my experience in business it usually has to pay, and provided prices and quality and equal, it is good business to reciprocate. I have knowledge of instances where prices may have been out of line, too high, but in the final analysis considering the ultimate dollar, it has been very good business to pay a premium.

At a certain point, there is a plant making an article used by railroads and power plants generally. The plant ships about 40 cars of freight a day over a certain railroad. On the other side of the plant is a competing railroad which gets about six cars of freight a day. The railroad uses not in excess of say $1,000 a month of the plant's products, but gets in return about $25,000 of freight. The plant's prices are within reason, but even if they were not, it would pay the railroad company to buy from them. There is another railroad with a large oil refinery on the line. The freight from this refinery is one of the principal sources of revenue for this railroad. From whom should they buy their oils?

Suppose any of us had a grocery store, and the fellow next door, who had a vegetable store, bought his groceries from us. Should we walk past his store to buy our vegetables?

—P. W. LAMSON.

FURTHER CONSIDERATIONS IN

Vitreous Enameling

Hand brushing of the edges of stove parts. Pieces with curved contours are placed on cushions resting on metal grids

C. D. CLAWSON
General Superintendent,
Chicago Vitreous Enamel Product Company

IN THE earlier days of the enameling industry, it was common belief that each sprayer required his enamel set to a different consistency. In plants producing large quantities of enamel ware, however, the sprayers are all taught to spray with enamel of the same consistency. The proper consistency is determined by tests and is measured in two ways: (A) specific gravity, and (B) viscosity. Either method will be found satisfactory, but many choose the viscosity method because of its simplicity.

The specific gravity method is simply the maintenance of a standard weight for a unit volume. A practical sized container holds approximately two quarts. The top of the container should be made like an inverted funnel with an opening of not more than 1 in. through which it may be filled. The desired weight is determined by checking the enamel several times when it is properly set up for good spraying.

With the viscosity method no scales are needed. Only a stop watch and a viscosimeter are necessary. The measurement taken is the amount of time required for a certain volume of enamel to flow through a small opening. One precaution in the use of a viscosimeter should be noted: that is the maintenance of a standard sized opening, as the abrasion of the enamel will increase the diameter of the opening through which it flows. This should be checked frequently.

Usually the enamel is delivered from the mill room to the spraying department in large tanks or tubs. It is important that the enamel in these containers be stirred thoroughly whenever a spray pail is to be filled. If this is not done, the water will slowly come to the surface, and the consistency will vary as the enamel is used. Where the enamel is sprayed directly from large tanks or containers, it is necessary to provide some means of agitation, either mechanical or by compressed air.

Spraying of porcelain enamel requires skill and considerable experience on the part of the operator. If too much enamel is applied on the piece, hair lines, tearing, or blistering may occur in the burning operation. Heavy coats of enamel are to be avoided. They are the greatest cause of chipping in assembly or in use of the article. Too light spraying is difficult to cover in the next coat and often necessitates a third cover coat to produce satisfactory work, although some enamels may be sprayed light due to the natural opacity inherent in the frit. An enamel that may be sprayed light and still cover the ground coat satisfactorily is highly recommended, since the lighter coats reduce the tendency to chip.

POOR spraying of the white coat and poorly drained ground coats are probably the most common causes of a rough or rippled appearance. The factors in the spraying operation which may produce this defect are: (1) Consistency of the enamel, (2) air pressure delivered at the nozzle of the spray gun, (3) the distance the gun is held from the work while spraying. Uneven

spraying is the result of carelessness or poor training on the part of the sprayers and can easily be corrected. The most important requisite is competent supervision. It is important that sample pieces from each sprayer be burned at frequent intervals, as the quality of the work is largely dependent upon the sprayer's judgment. All the factors that may affect his work should be as nearly standardized as possible. A good sprayer, for example, may be impaired by too frequent changes in the consistency of his enamel.

Spray pails or containers should be washed thoroughly at least once each day, and each batch of enamel screened before use through a sieve, the mesh depending upon the grinding of the enamel. A cover should be provided for the container; otherwise the enamel will become infiltrated with dirt.

Sometimes epsom salts or similar substances are added to set up thin enamel. This practice is not recommended, however, as the enamel will have a false body and may produce ware with a noticeable tendency towards the "orange peel" or uneven, rippled finish.

Spraying porcelain enamel requires skill and experience on the part of the operator, but the most important requisite is competent supervision . . . . All the factors that may affect the work should be as nearly standardized as possible. A good sprayer may do poor work because of too frequent changes in the consistency of his enamel

In many plants a large portion of the ware is brushed around the edges after the enamel has thoroughly dried, in order to reduce chipping. Brushing can be separated into two general classes: (1) Wheel or machine brushing, and (2) hand brushing. The equipment necessary for the latter is similar to a polishing jack with brushes attached in the place of the grinding or polishing wheels. It is important to choose the correct type of brush. If the fiber is too stiff, the enamel will be bruised and will chip when the piece is pressed against the wheel; if the fiber is too soft, the brush will spread under pressure and produce a ragged edge. Equally important is the speed of rotation of the wheel, which should vary from 400 to 500 r.p.m. This type of brushing is best adapted to flat work; however, many companies have been able to brush successfully such items as stove door panels and similar parts with irregular surfaces.

IN brushing the edges of a sheet, it is usual to cut a heavy paper pattern which should vary to conform to the brushing specifications. A very satisfactory paper is 100-lb., red press board. The pattern is placed in position on the piece with the aid of a gage or markings on the surface of the enamel and is held in place by the operator's thumbs at each end of the strip to be brushed. This is pressed against the wheel and the exposed enamel brushed off. The piece is then turned, care being taken to hold the pattern in place, and the remaining edges are brushed.

Considerable skill and experience are required to make this method of brushing efficient, but once the operator becomes familiar with the work, a considerable saving over hand brushing will be effected.

Hand brushing is usually done by women. Such work requires considerable skill in handling. Carelessness will result in scratched work. The operators should first be taught to do their work carefully before they are asked to increase their output. A great many tools are required for hand brushing. The most common equipment is an edging brush, made in many standard widths ranging from one row $\frac{1}{8}$ in. wide to ten rows about $1\frac{1}{4}$ in. wide. These brushes are furnished with an angle bolted to the underside of the brush. This angle is held against the edge of the piece while brushing, acting as a guide.

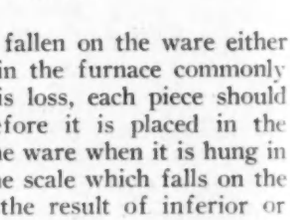
If the contour of the piece is such that a brush with a straight guide cannot be used, a small steel marker can be made, similar to the one shown in the sketch. The steel used is generally hardened spring steel. After the mark has been made, the enamel to be removed can be easily cleaned off by the use of a small piece of felt.

Another common tool is the bolt-hole brush used to remove enamel around bolt holes to prevent chipping in assembly. It is a small circular brush with a steel guide inserted in its center, made to be used by hand or with some mechanical attachment for rotating the brush.

Many stove manufacturers specify brushed round or diagonal corners. By using this type of brushing the enamel is removed some distance for the corner of the ware without spoiling the appearance of the finished article. Small templets of sheet zinc or cardboard are used, cut to conform to the pattern specified.

The brushing of the individual parts should be studied with two thoughts in mind: (1) To reduce the possibility of chipping in assembly, (2) to improve the appearance of the finished product when all of the parts are in place. The latter can be accomplished by a careful study of the assembled parts. The corners should be made to match.

SCALE and dirt which have fallen on the ware either previous to burning or while in the furnace commonly cause rework. To prevent this loss, each piece should be thoroughly brushed off before it is placed in the furnace. Dirt cannot fall on the ware when it is hung in a vertical position. Much of the scale which falls on the ware while in the furnace is the result of inferior or dirty burning bars. Only the best alloys can withstand the severe stress of constant cooling and reheating to which burning tools are subjected. To insure absolute freedom from this kind of scale, it is necessary to purchase the very best to be had in heat-resisting alloys. It is also advisable to have all burning bars sandblasted at least once every fifteen days when they are in constant service.



Hardened spring steel marker for scratching the edge of pieces with irregular contours prior to brushing the dried enamel clear

Recording pyrometers are essential for accurate control of the burning operation. These instruments should be checked frequently in order to insure their accuracy. A frequent source of enameling trouble is a pyrometer which is thought to be correct but is giving a reading which may be 50 degrees or even more from the actual temperature.

Tom Johnson Turns Down An Efficiency Expert

JOHN R. GODFREY

OLD MAN JOHNSON is just back from a long vacation. He got a lot of fun out of telling me how young Tom tried to put it all over him while he was gone. That's the way he tells it, anyhow.

"I hadn't more than got started, Godfrey, when Tom hires some kind of an expert to look the plant over and tell him how rotten it was — at ten dollars an hour. He just thought the place must be out of date and wanted to show me a better balance sheet when I got back.

"It didn't take the young efficiency expert long to find a lot of things that didn't agree with his ideas or with the sort of things he'd seen in some of the big plants, and it wasn't long before he had a list of suggestions as long as your arm. In fact he didn't find much that was right.

"You've only looked at the shop once, E.E. . . ."

"The young E.E. tackled the snipper shop first and thought he'd struck a bonanza. The machines didn't look hard to build and he spotted the absence of jigs and fixtures at once. He didn't just see how any shop in these days could build machines in such an old-fashioned way, and said that was an ideal place to begin because it was a small shop and everything seemed to be wrong with it.

"He told Tom he was a wise man to call in expert advice when he had such a problem as that left on his shoulders. No planning of work, no piece work or bonus, no anything that was modern.

"So Tom asked him how much he'd advise spending on jigs, fixtures, and tools, and of course he hedged, as most of 'em do. But he thought that about fifty thousand would make a good start, anyhow. Then we could increase the output at least thirty per cent and probably reduce prices a bit also. And if we put in his pet bonus system, labor costs would go down out of sight. You just couldn't expect men to do a decent day's work unless you dangled some sort of a prize package in front of 'em.

"From what Tom's secretary told me, Godfrey, I'd like to have heard Tom tell the E.E. a few things he hadn't even thought of. But she's a wise little lady and took most of it down in shorthand for me — had it all typed out for me when I got back. Tom was certainly on the job, J.R. He tried to let the boy down easy at that. Told him he hadn't any doubt that some of our methods seemed out of date to a man who was only familiar with high production shops, but that he'd overlooked one mighty important fact that counted when you came to figure out dividends. But let me read you this, Godfrey. It's good," and he pulled out the copy of the conversation.

" 'You've only looked at the shop once, E. E., and you haven't asked a single question about the marketing of these snippers after they are made. You only know that we made a hundred a year for the past three years, and you want us to spend fifty thousand dollars so we can increase the output and save a little money on each machine. You don't know that we couldn't place three hundred more of those snippers if we sold them at half price — because we've already sold to over half the possible users in the world.

" 'We've sold three hundred at a good price because no one else had a machine nearly as good at any price. We haven't spent money for fixtures because we've had to make minor changes from time to time to make the machine a bit better here and there. And another thing you haven't looked into is the number of variations we have to make to suit different conditions. You lump them all as snippers, but we've a few more kinds than the famous fifty-seven.'

" 'BUT if you'd only made fixtures at first,' said the E.E.

" 'If we had, we couldn't have made the little improvements that kept us ahead of the game. That's where our skilled men came in. And on day work too. I don't say, E.E., that the cost of some of these machines might not have been lower. But our men know their job, we pay them well and they've turned out a good machine that has added a lot to our "rep" in that field.' "

"Not so bad for a youngster, eh, Godfrey?" said Johnson after he'd finished reading.

"It's mighty funny, Godfrey, how you bump into cases where a man gets one idea in his head and wants to use it on all occasions. This E.E. was probably a shark on tools and fixtures and his bonus scheme may have been O.K. where there was a constant repetition of work in quantities. But he hadn't looked to see what sort of a market we were supplying, and he had never heard of a machine where five hundred was the absolute limit.

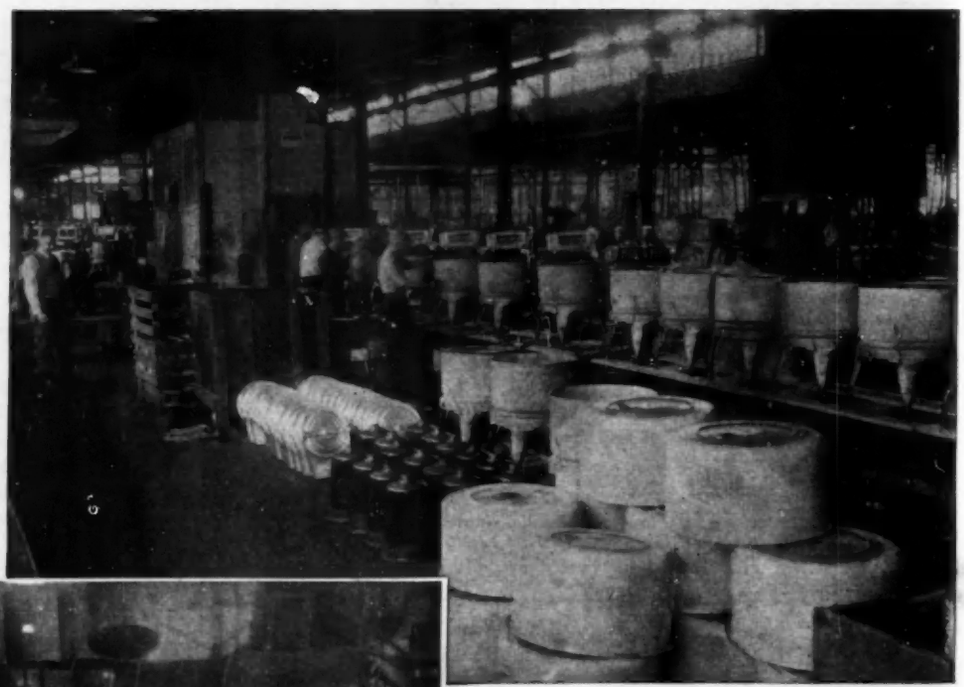
"That's where a lot of motor builders fall down in complaining about high prices of some of the modern production machine tools. They build thousands of motors every month and know how little machine work costs when it can be done in special fixtures and on special machines. But if they knew that the market could only absorb five hundred motors and that they had already sold over half of these — the easiest half by all odds — they'd sing a different tune."

The A B C of Washing Machine Assembly

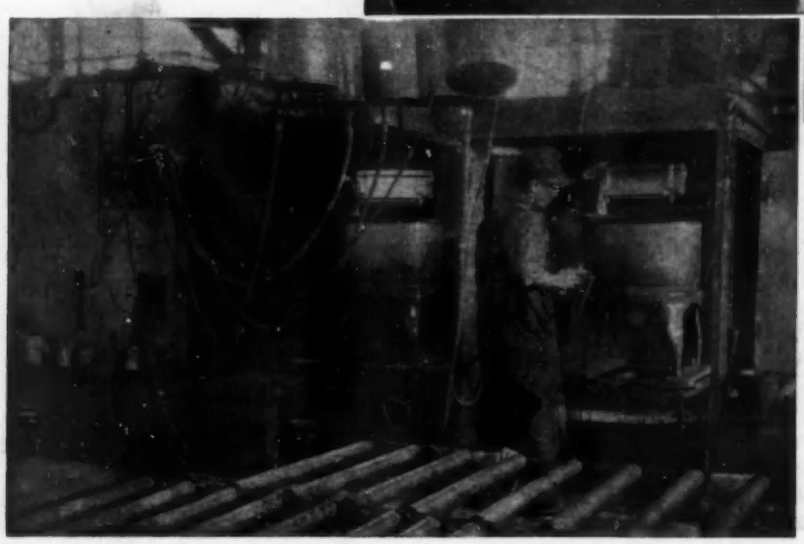
FRANK J. OLIVER, JR.
Associate Editor

Photographs taken at the plant of the Altorfer Brothers Company, Peoria, Illinois.

Bases and drive components of A B C washing machines are attached to the enameled tubs



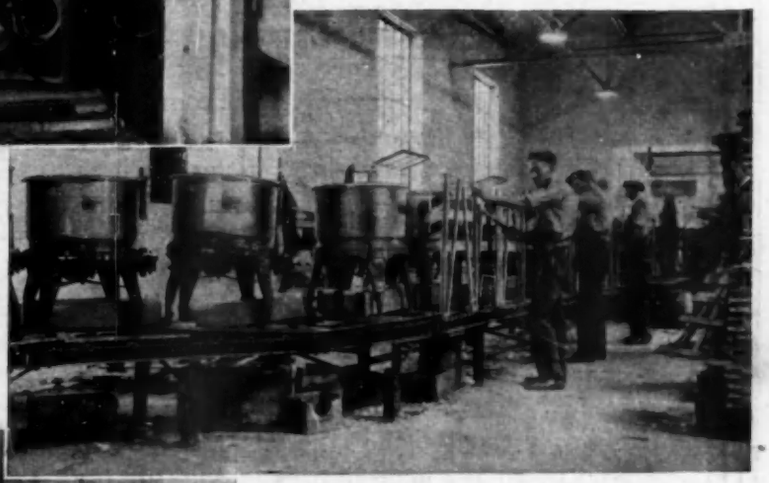
Further down the line the machines are inverted and screwed to wooden frames which later form the bases of shipping crates. After the wringer attachments are applied, the machines enter the sound-proof inspection booth where the mechanism is tested for quietness of operation



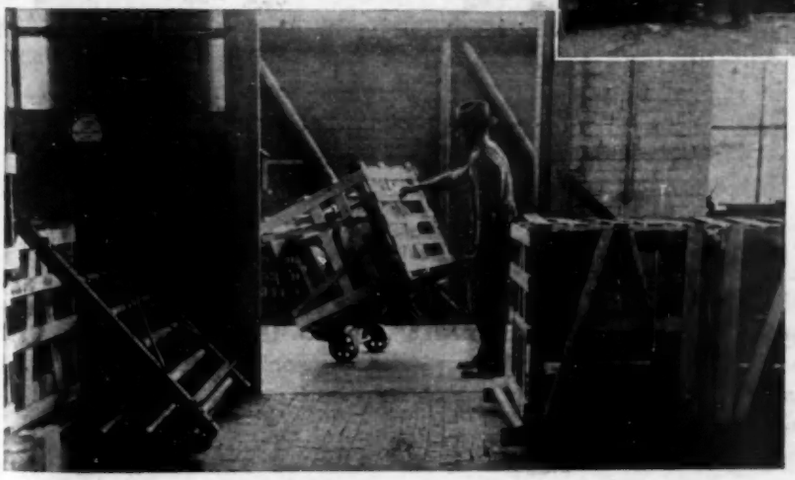
A primer and a finish coat of lacquer are given the bases, paper being used to protect the enameled tub. After each spraying, the work is carried through long dryer tunnels by a power-driven chain

Upon leaving the dryer tunnel, the excess lacquer is wiped off the tub with a solvent, the decalcomania transfer label is applied, and the machines are tested with the tubs filled with water, all while they are carried along the conveyor

The third and last inspection booth. Here a check is made to see that the finish is not marred and that all attachments have been applied properly. From this point the finished machines continue along the conveyor into the long crating department



Crate sides and tops, made with power nailing equipment in a near-by bay, are assembled around the washers as they are pushed along the roller conveyor



From convenient points along the roller conveyor the crated machines are trucked directly into freight cars. Aisles are kept open by means of hinged sections of the roller frame

The Foreman's Round Table

FROM SOUP TO NUTS

"COME on, let's eat," hailed Ed, as he entered Al's office. "I crave sustenance."

"Be right with you as soon as I wash my hands," replied Al. "I have to practice for that banquet tomorrow night. Have you had your wife run the vacuum cleaner over that full dress suit that you never had? You're going, of course?"

"Yes, of course—not."

"What, not after Williams gave you a personal invitation?"

"No, not even after that. I'm giving all I've got to the company while I am at work, but my off time belongs to me, myself, personally. I had much rather be down at camp smoking my pipe and listening to the mosquitos hum on the outside of the screen door than be patronized at the country club."

"You have the wrong idea, Ed; in this particular instance, anyway. The company is celebrating its thirtieth anniversary. I figure that we foremen have done just as much as anyone else to make it successful. Therefore, in my own mind at least, I go as an equal, and nobody can patronize me."

"Yes, that's all right. But they will try to just the same. Take the treasurer for instance. He never butts into anything that he don't mess it all up. He'll be there in a white vest telling how he has managed to hold down the expenditures in spite of the extravagant ideas of the shop in regard to new equipment. Also, J. Everett Dickey, who doesn't know the difference between a lathe dog and a Russian wolfhound, will be there to show us what the well-dressed foreman will wear for evening calls this year. Nay, nay—not me."

"Your picture is not quite complete. At the right hand of the chairman will be the guest of honor, J. Everett's uncle, one of the founders of the firm. He'll be dressed up like a lamp post and sweating like a horse. Everyone will envy him, but he will be thinking that he'd give all his money if he could only wear clothes like his empty-headed nephew. Don't forget, big boy, that most of the big machine shops were started by mechanics like you and me. Those who are still at the head of their companies are men who used to hire full dress suits and attend functions like this. You can't acquire the social graces and golf after you get old, popular opinion to the contrary notwithstanding."

"Well, I didn't expect you to agree with me. I suppose you are even in favor of the Tuxedo social club idea they are going to spring at the supper?"

"Sure, I am; that is if the big bosses will keep out. Williams knows enough to, so does the old man. I don't know about the rest. Williams believes that the foreman or superintendent who thinks that because he is efficient in a business way he can afford to be independent socially, is handicapping himself for the future. He says he would like to see each of his foremen wear out a Tuxedo suit every year."

"Maybe he does, but I prefer pajamas."

A competent mechanic is likely to be somewhat scornful of the white collar brigade, but can he afford to neglect the social side of his development? Pull, without merit, may not profit much, but merit plus good social contacts may carry a man a long way. Foremen and others are invited to discuss this question.

Suggested by Morton Schwam

▸ ▸ ▸ Discussion of Former Topics

Government Work

Doing "government work" in a shop is like using limousines to haul bricks; it can be done, but it is very expensive. If the company were to charge for personal jobs just what they are worth the men wouldn't be able to pay for them.

There never was a shop in which "government work" was permitted, where it was confined entirely to lunch periods and after working hours. It is done in working hours—by the men for themselves, and by them for the officials. The officials want their work done for practically nothing; the men know this and feel that they should be permitted to take care of their own small jobs. The result is that all companies permitting "government work" lose money on it.

There is just one correct answer to this problem, and that lies with the management. It is a blanket order of "No Government Work Allowed." And that applies to the officials and everyone. Under this rule it is easy to handle the men. Any deviation from it for any reason whatsoever means grief.

—James K. Matter, *Supervisor, E. G. Budd Manufacturing Company.*

Keeping Machines on the Job

The man who does the maintenance work should report to the man who has charge of the planning and scheduling of the machining operations, thereby making the last-named man responsible for maintenance. An inspection and overhaul schedule should be worked out using, for a beginning, the judgment and experience of those best qualified to know. A bonus based on the time the machines are shut down for repairs will assist in reducing the major repairs. Records kept on this work will further assist in determining the make of machine to buy when new or replacement equipment is necessary.

As a machine approaches its overhaul period, or if the last inspection indicates that its accuracy is not sufficient for certain operations, the man in charge of planning can order the machine shut down for repairs, or he can route work to that machine that does not require any greater accuracy than the condition of the machine will guarantee.

—F. L. Ingleright, *Superintendent, Bradford Motor Works, Inc.*

The repair man is as obsolete in a modern shop as the general handy man of bygone days. The modern mechanic doesn't tackle a new job with bated breath, fearful of a breakdown that may come before the job is finished. He plans his job before he starts, to avoid any breaks.

Perhaps, if we could devise some means of paying maintenance men as they pay doctors in China—where you pay only while you are well, and you stop paying and receive free treatment while ailing—that would be the ideal solution. Minimum shutdown time and material costs are the measure of true maintenance work, and they are not too difficult for practical measurement. Co-operation enters the picture in using judgment as to when to shut down a machine for inspection and overhaul—a feature which should be worked out between the foreman and maintenance man, with the latter having the final say, unless reversed by the general superintendent.

—Charles Klyne, *Foreman, Russel Machine Company.*

A good repair man can be developed into an efficient maintenance man if he is given clear cut instructions along the following lines and obeys them to the letter. Each machine on being installed should be thoroughly examined and tested, lubrication details noted, and parts likely to first show signs of wear made and kept on hand, or ordered from the makers. A weekly or bi-weekly inspection should be made of each machine and, where repairs are indicated, a time estimate given to the department foreman. He can arrange his schedules to cover the break in production either by working overtime, or if possible, by substituting another machine. Where an oiler is employed, he should work under the maintenance man and be instructed to report any signs of wear. The operator of each machine should be held responsible for wrenches, handles, etc. By strict attention to these important details, breakdowns can be avoided, repairs reduced to a minimum, and the maintenance man can keep the machines on the job. —Robert S. Alexander, *Universal Winding Company.*

Spring Song

Human nature always wants more than it has, and this applies equally to the wage earner and the man of millions.

Some men will ask for more pay knowing full well that they are not worth any more than they are being paid, and when you question them to find out why they think they should receive more, they will tell you that Jim Smith is receiving so and so and they don't see why they should not receive the same rate. A goodly number of them cannot be convinced that they do not turn out as good or as much work as the said Smith.

I believe the best method of keeping men contented as regards wages is to give them some sort of bonus or piece work.

These methods put it up to the man to show what he can do, and his wages reflect his ambition and ingenuity.

It is very unwise to pay a new man more than the best men in your employ. The old men will find it out and you will lose the respect of your best men.

I believe the policy of paying men what they are worth at all times is the best one to follow. If a man asks for an increase and he is not worth more he should be told frankly why you cannot give him more. It is much better for the man to get it "off his chest" than to worry about it.

Sometimes you hire a man who overrates himself; tells you he can do things that he has very little knowledge of. In such an event it is best to drop him just as soon

as you are fully convinced that he cannot earn the rate at which he was hired.

The wage rate question has always been, and probably will always be, computed by an empirical standard. What one person thinks a man is worth may be greatly at variance with what some one else thinks he is worth. A positive formula would be out of the question.

—Wm. C. Betz, *Master Mechanic, The Fafnir Bearing Company.*

Mottoes in the Shop

If good judgment is used in their selection, mottoes around the shop will do a great deal of good. They should be changed about once a month, and not too many should be used.

If Ed had one of the fundamental rules of good foremanship hung where he could see it once in a while, namely "Don't do anything you wouldn't let your men do," he would not have got into a jam by eating forbidden fruit and sneaking a smoke during working hours.

Reading a motto such as "Good intentions make fine stepping stones, but a poor crutch," will not hurt a man's morale, neither does it hurt a man who is inflated with the knowledge of his own ability to read a little common sense, such as, "No man is indispensable, his value depends upon his loyalty."

—H. H. Vincent, *Machine Shop Foreman, Hupp Motor Car Corporation.*

If the mottoes that are posted, or otherwise circulated, are in keeping with policies of the management, there is no doubt that they will produce a good effect on the individuals whose attitudes are in line with those of the management. The quality of the management of any industrial organization is pretty well known by the personnel throughout the entire system.

If this quality is of the highest type, where honesty is the best policy, service the ambition, perfection the goal, then mottoes conveying the same ideals will stimulate all individuals whose attitudes correspond.

Similarly, if the policies and conduct of the management are somewhat loose, tending to subterfuge and trickery in getting the most for the least services rendered, then the mottoes should be tempered accordingly, conveying the same idea. These mottoes will also stimulate those persons whose attitudes are in line.

—R. B. Huyett, *Engineering Division, Pangborn Corporation.*

Foremen and the Wage Bonus

Foremen should not be participants in any bonus system which is based on productive effort.

Undoubtedly the surest and simplest method for stepping up production is the installation of wage incentives for the workers. This requires less supervision on the part of the foremen, with the exception of more rigid inspection to see that quality is maintained.

Recently I witnessed an attempt to award a production bonus to either of two foremen who were in charge of a department which operated on a two-shift basis. It ended disastrously. The rivalry which developed became so keen that essential mechanical repairs were put off and left to handicap the opposite shift.

The foreman is the leader of his men. If his company is worth working for, he will give it his best, regardless of a bonus. All companies are cognizant of their foremen's efforts and reward them with periodic salary increases and promotions.

A yearly bonus for foremen based on personal achievements is used by some concerns with success. At the end of each year the foreman is required to fill out a personal achievement form in which are given details as to increased production, reduced cost, simplified procedure, etc., accomplished during the preceding year. At the same time he is required to fill out a forecast for the coming year, giving similar details and data as proposed to be executed. The managerial executive compares the original forecast with the actual accomplishments and awards a bonus to each foreman, dependent on the departmental prosperity.

—H. S. Deeley, *Engineer, Canadian Johns Manville Company.*

Why Conferences Anyway?

Conferences, to my mind, are a very good thing and extremely helpful in the running of a works, if conducted on the proper lines.

They should always be presided over by someone in authority who has a practical grasp of the subjects likely to be discussed. The man in charge should be firm enough to close any discussion leading nowhere, and also be able to draw out the man who is chary of expressing his ideas. Above all, he should make it clear that there need be no feeling that any expression of ideas is to be construed as a complaint against any particular person or group in the meeting.

If these conditions are fulfilled, there is no doubt that most conferences will lead to results. When a conference is presided over by a man of the same rank as the members, the proceedings generally degenerate into fruitless discussions that, more often than not, end unpleasantly. —T. Greening, *Coventry, England.*

A chairman's chief duty is to keep the men in a conference confined to the points at issue and prevent arguments developing. He can only be successful in this if he is familiar with the broad issues of the discussion, has recognized authority from the assembly, and is independent of the issues.

To elect a fellow foreman to the position nullifies all these needs, for his knowledge is limited to his own section and its immediate contacts.

A foreman in the chair loses his opportunity to act in strict co-operation, on the same level as the rest.

If a consensus of opinion were obtainable it would probably be found that none of the delegates coveted the position, but were unwilling to elevate, by election, a brother foreman.

It should be an easy matter for them to obtain sanction to elect a suitable member of the management and still maintain their self-expression. —James G. Turton, *Heald Machine Company.*

Boss, or Advisor?

If he is to get results, the foreman must be the real boss in his department. But he must govern his men according to circumstances and not by rule of thumb. When necessary, he should be as harsh as the case requires, but this should not happen very often. Prac-

tically all of the time, diplomatic methods will answer his purpose much better.

He should study his men to find what methods to use with each one. He should learn the motivating influences that bring the best reactions from each man. In this way he will win their hearty and willing co-operation and get them to work with him in his efforts to get out the production. When this has been accomplished, he will get better results with a minimum show of authority.

—L. O. BROWN, *Toolroom Foreman, Holcomb and Hoke Manufacturing Company.*

Closing the Door to Late Comers

A workman has a legitimate excuse for being late to work when the cause of delay is beyond his control or the occurrence unpredictable. These circumstances may be many and varied but the law of average will prevent them from applying repeatedly to any one person. Extra time should be allowed by the workman when he knows of possible delays such as slippery streets or a heavy fog.

To lay a man off for an hour or a whole day because he is two minutes late is imposing unnecessary loss on the company and should be avoided. One must also consider the inconvenience to those who work with the late comer before laying him off.

It is the duty of the foreman to see that his men are at work on time. He can handle many cases of tardiness by admonition or reprimand, but when these fail, stricter methods must be used. One effective method of controlling tardiness is to dock a late comer's pay an extra hour although he must go to work immediately upon arrival. The slack period is a good time to eliminate the stubborn late comer. —HARRY L. HAZZARD.

Perhaps Al's idea of a proper penalty for tardiness was a little severe, but there are times when such things have to be done in order to impress the importance of obedience upon the minds of those who seem to think that rules were not made to be obeyed.

There is no valid excuse for employees who are always coming in late, and they should be penalized for doing so.

The method used by the Pump Company may not always be fair to all concerned, but in cases of unavoidable tardiness the matter could be very easily adjusted.

As a rule, when the company asks men to stay and work late they are well paid for doing so; in turn the employee should give his employer a fair deal by being "on the job."

I have often noticed that the man who gets his foot inside the door just ahead of the whistle is among the very first of those who can be seen taking off their aprons five minutes ahead of quitting time and is also the first man out of the door when the whistle does blow.

—FRANK A. HYDE, *Walworth Company.*

The Chain Store Problem

In a plant where I held a semi-official position, and where the sale of candy was not allowed, I had a very interesting experience. Candy was being sold but could not be bought by everybody and especially not by anyone above the rank of workmen. I asked one day how I could buy a bar of candy and was told to see so and so. He told me the method was similar to Kentucky bootlegging. Leave your money and order at a given place and go away. Delivery was made by messenger the next time the customer came by that spot. The messengers were workmen who were not required to stay in one place, and were changed often for obvious reasons.

The best plan that I have seen is in use at our plant. Vending machines with several kinds of candy are found in the shop. The Athletic Association has charge of the machines and receives a good percentage of the gross receipts. An interesting point with this arrangement is that slugs are hardly ever found now, whereas, formerly, when an outside firm had a few machines in use, slugs were very common.

With an arrangement of this kind the call for permission to sell candy is done away with. Permission to sell other things can be restricted to the noon hour and should not be a serious problem.

—L. F. SWENSON, *Industrial Engineer, Perkins Machine & Gear Company.*

When Personal Tools Are Damaged

Usually it's just too bad for the owner of the tool, and the rare exception only proves the rule. Tradition of the machine shop, economic necessity, and the difficulty of equitable adjustments in such cases have all combined to bring about a condition almost the equivalent of an unwritten law.

A very good parallel would be to pay the painter who decorates your house for all such breakage. The carpenter could also claim his per cent. How about the mechanic who breaks a wrench while repairing your car? It simply can't be done and be economically sound at the same time. The toolmaker's rate predicates such breakage and makes allowance therefor. It is expected and assumed that he has a kit of needful tools and will use them for the company's benefit when he is hired. Subsequent breakage might be charged to carelessness or the age of the tools just as justifiably as to lay it at the company's door. —E. R. SHIELDS, *Processor, Oakland Motor Car Company.*

No Verbal Orders Accepted

In order to understand why certain perfectly logical rules fail to function when executives are involved as direct violators, it is necessary to understand a little of the executive mind. That mind is continually jumping from one problem to another many times in an hour, every hour of every day of every week. In order to function properly, a problem solved is a problem dismissed. Consequently, when an order is issued it is necessary to clear the tracks for new problems, and the executive is perhaps the first one to forget the "procedure rules" he himself has created for general functioning.

Problems such as that created in the cited example are easily handled by the use of a little tact. Merely to call attention to a rule violation on Ed's part would have been unnecessarily harsh. But if, when Williams gave him the dimensions, Ed had written them down, ostensibly for the benefit of the mechanic, but reading them back to Williams as he did so, the difficulty would have been tactfully avoided. It seems to me that those foremen who always resent detail orders from a superior, would welcome such an opportunity to display initiative and executive ability. —B. E. LAMBERT, *Draftsman, Naval Aircraft Factory.*

Must Tools Be Equipped with SAFETY DEVICES?

LESLIE CHILDS
Counselor-at-Law

AS A general proposition of law, machine shops and like industrial employers are bound to furnish their employees with a reasonably safe place in which to work, and this includes tools and other appliances used by employees. In other words, if an employer knowingly furnishes an employee an improper or unsafe tool, and injury results to the employee through its operation, the employer will usually be held liable therefor.

So far so good. The question, however, of whether an employer is also bound to equip tools and appliances with modern safety devices for the protection of the employee is "a horse of a different color." The court decisions on this point are not uniform. But, by the seeming weight of authority, the failure of an employer to equip his tools with safety devices will raise a question of fact as to his negligence.

To put it another way, if an employee suffers injury through the failure of his employer to equip a tool with a safety device, the question of whether the employer has been negligent will depend on the facts of each case.

In one case of this kind, the defendant was a corporation engaged in operating a boiler and sheet-metal plant. The plaintiff was employed in the plant as a boilermaker, and had had many years experience in his work.

Upon the occasion out of which this action grew, plaintiff was assisting his foreman in making repairs to the flues of a locomotive. A prosser had been driven into a flue, and plaintiff's foreman, desiring to work the prosser out of the flue, handed plaintiff a pneumatic hammer to hold while this was being done. Plaintiff held the hammer in a horizontal position, and as his foreman reached for a hammer with which he intended to loosen the prosser, he collided with the plaintiff and thereby threw the hammer in a perpendicular position. This projected the die from the hammer, the die striking the plaintiff in the eye, causing him a serious injury.

Following this accident, the plaintiff filed an action for damages against the defendant, based on the theory that his injury resulted from the failure of the defendant to equip the hammer with a safety device which would have prevented the die from being projected from the barrel of the hammer. The plaintiff in this court action offered evidence to show that such a device was in service in many machine and boiler works.

He contended that this device, attached to the muzzle of the gun, would have guarded the die from being projected out of the hammer during its operation. In the face of the existence and use of such a safety device in other plants, the plaintiff insisted that the defendant had been negligent in not attaching such device to its pneumatic hammer.

The defendant, on the other hand, contended that it was under no obligation to attach this safety device to its equipment. It claimed that the hammer it supplied was one ordinarily used in boiler work, and that it was under no obligation to go out of its way to hunt up a safety device that was not in general use. Upon the facts as they have been outlined the court submitted the case to a jury. The jury found that the defendant had been negligent, and gave judgment to the plaintiff for more than $12,000. The defendant appealed from this decision, and the higher court, in stating the general rule in respect to the duty of employers to furnish safety devices, said:

"If an occupation attended with danger can be prosecuted by proper precautions without fatal results, such precautions must be taken by the promoters of the pursuit or employers of laborers thereon. Liability for injuries, following a disregard of such precautions, will otherwise be incurred, and this fact should not be lost sight of. . . .

"TURNING to the facts in this case, we find, according to plaintiff's evidence heretofore detailed, that he was directed by his foreman to hold the gun in question, and while doing so, without action or negligence upon his part, the foreman bumped against him and thereby caused the gun to be in a perpendicular position and the die to be projected so as to strike plaintiff in the eye.

"The latter's testimony shows that if the gun in question had been supplied with the . . . guard heretofore mentioned, the injury would not have occurred; that said guard could have been furnished at a moderate cost, and used without impairing the effectiveness of the gun. Taking into consideration the facts in this case, we are of the opinion that the trial court committed no error in submitting to the jury, the question as to whether defendant was in the exercise of ordinary care, in directing plaintiff to use the gun in question, without it being supplied with the . . . guard, or some other device to render it reasonably safe, if unsafe, without such guard. . . . " (263 S.W. 497.)

In accordance with the language quoted above, the higher court concluded by affirming the judgment in favor of the plaintiff boilermaker, taking the position, that in view of the facts and evidence in this case, the verdict of the jury holding the defendant negligent for not supplying a safety device for its pneumatic hammer should not be disturbed.

Obviously, the foregoing case is one of force and value on the subject involved, but, being decided on its facts, it does not purport to announce any hard and fast rule that would apply in all situations. It constitutes, nevertheless, a striking example of circumstances under which one employer was held negligent for not equipping a tool with a safety device.

Graduates of the Warner & Swasey Apprentice School

Apprentices at work in the shop

Apprentice Training

To Develop Executive Talent

H. W. Boulton
Apprentice Supervisor,
The Warner & Swasey Company

APPRENTICESHIP in The Warner & Swasey Company is an institution almost as old as the firm. Shortly after opening their first shop, the partners began the training of boys as machinist apprentices. Realizing the value of their own apprenticeship, they resolved to offer even greater opportunities in their own shop.

The apprentice school, established in 1911, has been an important factor in the training program. It offsets in large degree the difficulties encountered in the present age of production, in which the foreman has little time for instructing the beginner. The school and all related activities are under the control and supervision of the apprentice instructor.

Classroom instruction in subjects of immediate and practical value is given for four hours each week, and for allied subjects and advanced studies the apprentice is urged to take outside courses in the night schools.

Believing that loyalty and strength in an organization can best be built from within, it has always been Warner & Swasey policy to select foremen of shop departments and other leaders from among apprentice graduates. Among such active leaders today are the works manager, superintendent, assistant superintendent, foreman of the designing department, draftsmen, shop foremen, and inspectors. In the sales organization, the school has furnished district managers, sales representatives, and demonstrators.

In the past, the purpose of apprentice training was to provide skilled mechanics only; modern training aims principally at the development of executive talent. The man with a thorough knowledge and foundation in the trade is most likely to prove the best executive.

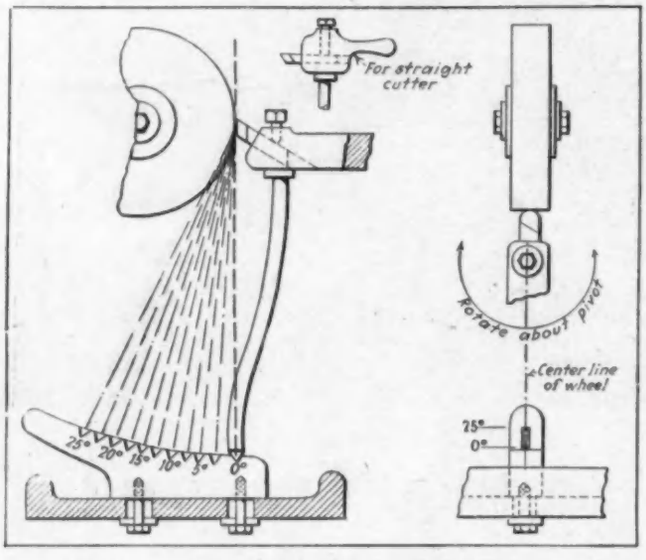
We are proud that in addition to those apprentice graduates who have come to leadership in our own organization, many more hold prominent positions with other engineering and manufacturing companies.

IDEAS FROM PRACTICAL MEN

An Aid to Tool Grinding

WILLIAM C. DRONBERGER
Instructor, Mechanic Arts,
Cass Technical High School, Detroit, Mich.

PRIMARILY, the device illustrated is intended for the use of students and apprentices, who, naturally, are unaccustomed to grinding tools for use in metal-cutting machines. It is intended to relieve the operator from the necessity of maintaining the correct angle while shaping the tool, thus permitting him to concentrate on the form.



Device to aid in obtaining correct clearance angles on tools

The toolbit is inserted in a holder of the same type as that in which the tool is to be used in the lathe or other machine. Supporting the toolholder is a rod, the lower end of which is pointed and rests in one of the countersunk holes in a segment attached to the pan of the grinding machine. A plumb bob is used to locate the zero hole, while the other holes are drilled at a distance apart that will be equal to 2½ deg. each as determined from the horizontal center line at the face of the wheel, their distances being found by calculation.

In operation the toolbit is held against the wheel with its axis at a right angle to that of the wheel spindle. In this position the front face is ground. Rotating the holder through an arc equal to the included angle of the tool, and pressing the tool against the wheel, results in the sides being ground, the clearance angle being determined by the location of the hole in the segment in which the point of the supporting rod rests. A round-nosed tool can be ground while rotating it through the proper arc and keeping it pressed continuously against the wheel, the point of the supporting rod resting in the hole that will give the desired clearance.

In all cases, the toolbit should project beyond the front of the holder a distance that will keep the holder level, when the supporting rod is in the zero hole and the toolbit is in contact with the face of the wheel. In grinding a threading tool, the angle of helix, as determined by placing the point of the supporting rod in the proper hole, will check up with the angle shown by a Starrett gage for helix angles, within half a degree.

A Thread-Cutting Stunt—*Discussion*

JORAN KYN

After telling how he cut a screw having a thread of increasing lead, H. T. Collinet, in an article under the title given above, on page 851, Vol. 72, of the *American Machinist,* says he has never found a use for the screw.

Many years ago, at the plant of the Brown & Sharpe Manufacturing Company, I saw a screw of increasing lead attached to an Evans' Friction Cone that was used to drive a cutting-off machine.

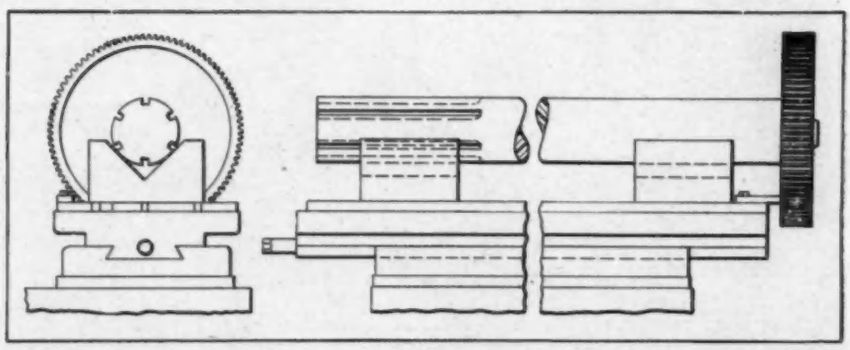
The screw was geared to the machine and fed the loose belt along between the cones. As the bar being cut off was reduced in diameter by the cutting-off tool, the screw fed the belt between the cones at an increased rate, speeding up the machine.

Indexing a Long Shaft

L. W. BLOIER
Foreman, Adams & Hillyer

A spline shaft I had to make was too long for my milling machine table. Since this shaft could not be indexed by ordinary methods, I left one end of the shaft long and turned it to fit a 120-tooth lathe change gear. I drove the gear on the shaft and punch marked every twentieth tooth since six splines were called for.

The shaft was mounted on V-blocks with the gear



A change gear used for a dividing head

overhanging the milling machine table. The gear was swung around until one of the marked teeth came in contact with a parallel strapped to the table. The shaft was clamped in this position and the first spline milled. The gear was then turned to the next marked tooth for the second spline and the operation repeated. When the job was completed and the collar fitted, the shaft was found to be accurately indexed.

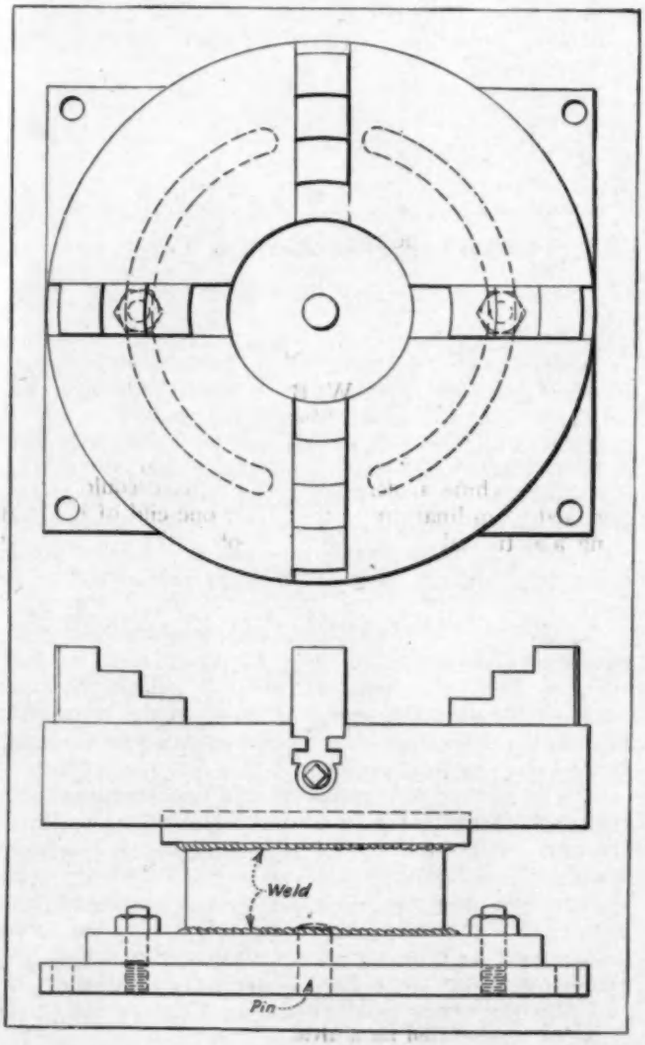
■

Using a Lathe Chuck on a Shaper

T. SAKAMOTO
Kashuku Plantation Company, Hawaii

A universal lathe chuck or a four-jawed independent chuck is a very convenient piece of equipment on a planer or shaper. Round or irregular work that would be very difficult to clamp in a vise or by strap, may be readily held in a chuck.

I have adapted a lathe chuck for this purpose by the method shown in the sketch. One-inch steel flanges are welded to both ends of an eight-inch pipe. The lathe chuck is screwed to one of these flanges. In the other flange are milled two semicircular slots which permit angular adjustment. Two ¾-in. studs, extending through these slots, afford means of securing the lower flange to a base plate which in turn is provided with bolt holes.

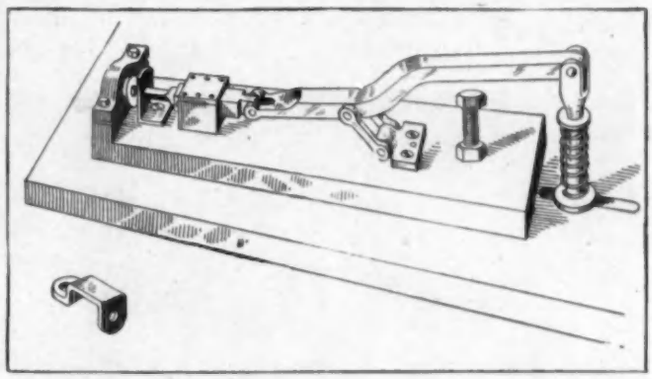


A Small, Toggle Bench-Press

CHARLES H. WILLEY
Assistant Plant Superintendent
Hoyt Electrical Works

In the illustration is shown a punch press of the toggle type that was made for punching, forming, and piercing small parts, such as the one to be seen in the lower left-hand corner.

Such a press is very convenient where many small parts are to be made. While it is powerful, it can easily be operated by a girl. Motion of the ram is controlled by foot power through a lever and a toggle, a pedal on the floor being connected to the vertical rod at



the right. An adjustable stop, against which the lever contacts, limits the stroke of ram. The punch and the die are, of course, removable and others can be substituted for them.

■

Making a Formed and Relieved Cutter

P. W. NIELSEN
Wallasey, England

The method we used in making a formed and relieved cutter for milling the tooth spaces in a 1½-in. chordal-pitch sprocket for a roller chain, may be of interest.

We made the blank, 4 in. in diameter, from 18-per cent tungsten steel and gashed the teeth in the milling machine. For forming and relieving the teeth at one operation, we made an end mill of the shape of the tooth space. We then made an eccentric mandrel, ¼ in. out of center, to fit the dividing head of the machine. The mandrel was put in place in such a position as to give the necessary relief to one side of one tooth and the cutter blank was set with the cutting face of one tooth vertical. With the end mill in a vertical attachment, one side of this tooth was both formed and relieved by rotating the spindle of the dividing head during the cut.

For forming and relieving one side of the second tooth, it was necessary to turn the spindle of the dividing head back to bring the eccentric mandrel to its original angular position, loosen the cutter blank on the mandrel, and bring the next tooth into the same position as that occupied by the first one when the operation was started. This procedure was repeated until one side of all the

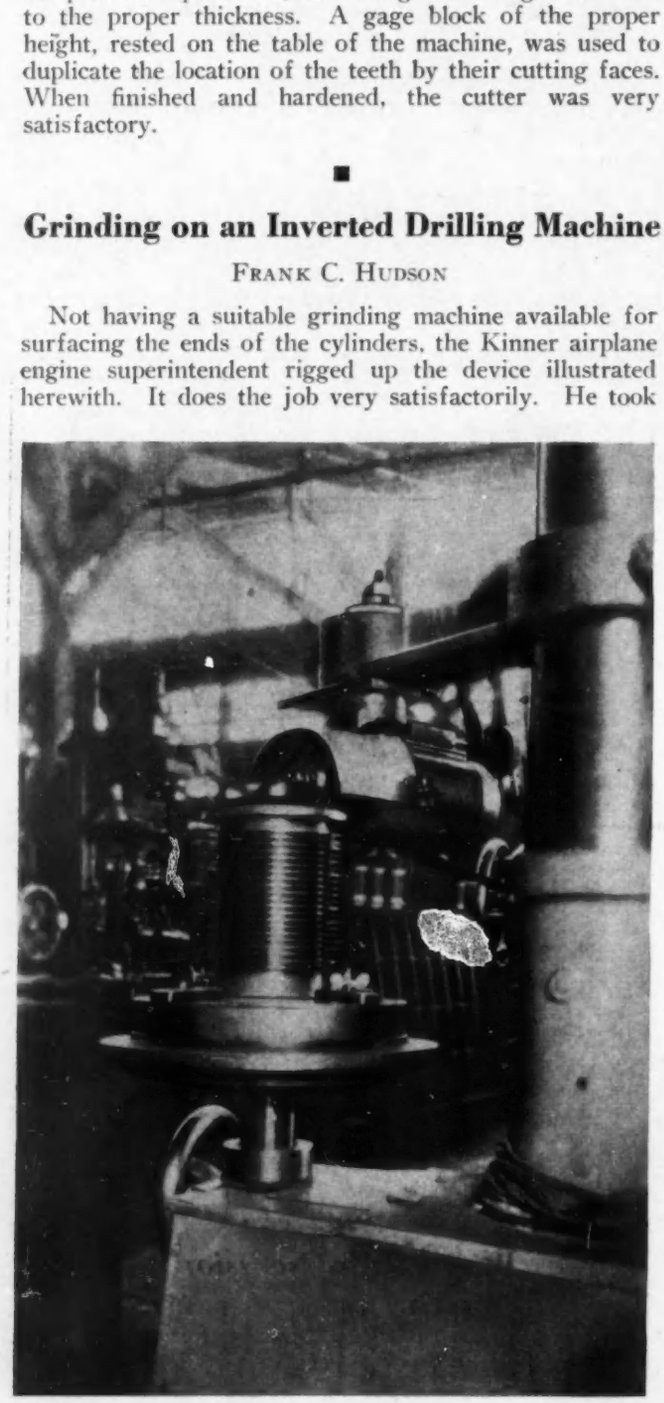
teeth had been formed and relieved. The blank was then set to bring the end mill on the opposite side, all the teeth being formed and relieved on that side by repeating the previous operations, care being taken to get the teeth to the proper thickness. A gage block of the proper height, rested on the table of the machine, was used to duplicate the location of the teeth by their cutting faces. When finished and hardened, the cutter was very satisfactory.

■

Grinding on an Inverted Drilling Machine

FRANK C. HUDSON

Not having a suitable grinding machine available for surfacing the ends of the cylinders, the Kinner airplane engine superintendent rigged up the device illustrated herewith. It does the job very satisfactorily. He took



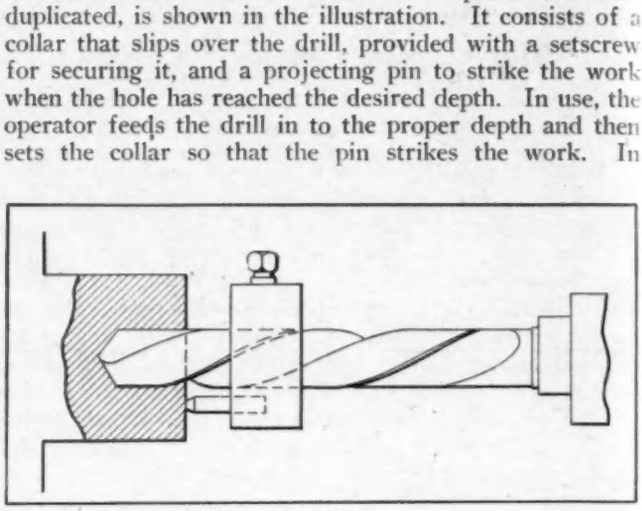
a standard vertical drilling machine that was no longer needed, cut off the base, and turned what was left upside down as shown. The top of the frame was mounted in suitable braces, the new base being enclosed by metal.

On the end of the spindle, he mounted a face plate with a suitable recess for the cylinder flange and clamps for holding it. This face plate is driven by the usual mechanism that normally drives the drill. On the underside of an arm is mounted a portable electric grinder that swings on the column and surfaces the end of the cylinder as it is revolved by the inverted spindle.

A Time-Saving Stop for Drilling in the Lathe

H. L. WHEELER
Tool Designer, Engineering Division,
U. S. Hoffman Machinery Corporation

A simple device for quickly gaging the depths of holes drilled in the lathe, when a number of pieces are to be duplicated, is shown in the illustration. It consists of a collar that slips over the drill, provided with a setscrew for securing it, and a projecting pin to strike the work when the hole has reached the desired depth. In use, the operator feeds the drill in to the proper depth and then sets the collar so that the pin strikes the work. In



drilling subsequent pieces, the depth of the hole is controlled by the pin touching the work and preventing further feeding.

This simple little device will be found very useful in shops where small runs of work are drilled in the engine lathe or the turret lathe.

■

An Improvement in Taps

CHARLES A. PEASE

In the lower part of the illustration is shown a type of so-called taper tap that I have used for many years. It is not obtainable in the market, nor do I think it has been previously described. The radical difference between this tap and a tap of the usual type will be made clear by a study of the upper and lower figures, in which the upper one is a tap of the usual type. My tap, to be seen in the lower figure, has an actual taper thread at the start, while the ordinary tap has a straight thread throughout, the tips of the teeth being tapered off at the start.

At the right are enlarged diagrams indicating the progressive cuts made by the successive teeth of both types of taps, in which the numerals indicate the cuts made by the different teeth, beginning at the start. My tap has the following advantages over a tap of the usual type:

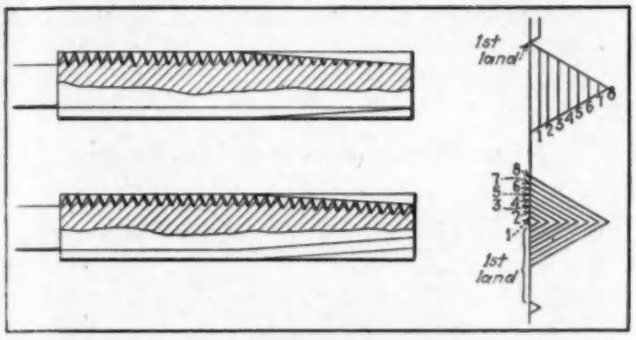
1. The cut starts very lightly, the teeth cutting at the tips only, instead of a broad cut equal to the width of the roots of the teeth. This feature makes the tap work very easily at the start, and as the teeth at once get a leading bite into the work, a positive lead is at once assured. Thus, any overriding effect that so often occurs with an ordinary tap in starting the thread in a rather close hole, or in hard material, is eliminated.

2. The first teeth do the least work, as should be the

case, instead of the most, which is unavoidable with a tap of the ordinary type. This action is plainly indicated in the two end views. Successive teeth gradually increase the amount of metal removed, making the tap easy working, rapid, and much less likely to break from the strain of cutting.

3. With the ordinary tap, the first tooth takes a cut of the same width as that of its base, leaving only the slender tips of the teeth in the hole between cuts. These slender tips are likely to be broken off, leaving rough and imperfect points to the thread. My tap, on the contrary, takes a very narrow cut at first, leaving a wide, strong land between the threads, which is gradually reduced by successive teeth until the full thread has been cut.

4. With the ordinary tap, a portion of the side of each thread is successively formed by each tooth, which portion is not to any extent affected by successive teeth. By this action, the successive teeth only deepen the cut, leaving the sides of the threads a succession of single, fairly heavy cuts, and therefore rough. In my tap, the taper cuts progressively at the sides of the threads as well as at the bottoms, shaving the sides gradually by thin, shaving cuts. This action produces the same effect as that of the finishing cut made with a "series" tap,



Above—Ordinary type of tap. Below—The author's improved type of tap. Right—Enlarged graphic indications of the action of both types of taps

the last cut being a thin shaving taken from the full depth of the sides of the threads, leaving a smoothly finished job.

5. Owing to the characteristics indicated above, my tap cuts freer, smoother and faster, and is less subject to breakage (due to less strain) than is a tap of the ordinary type.

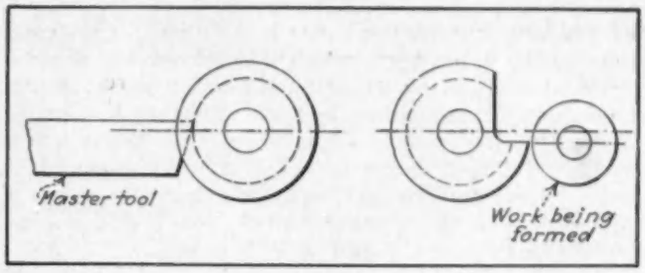
■

Making Circular Forming Tools

CHARLES KUGLER

Circular forming tools, being gashed below the center, will not produce parts of the same contours as those of the master tools by which they are formed, when the master tools are set at the horizontal center line. Consequently, calculations are necessary to determine the proper contour of the master tool.

A method by which all calculations can be eliminated is to make the contour of the master tool the same as that of the piece to be produced, and to give it plenty of front rake. In turning the forming tool, the master tool should be set as much above the horizontal center line as the forming tool is to be gashed below it, as



shown diagrammatically in the illustration. This method seems to give automatically the correct shape to the forming tool. Of course, the master tool must be of the proper contour on its flat top, and not on a line normal to the front rake. Also, the master tool must be set parallel with the horizontal center line of the forming-tool blank.

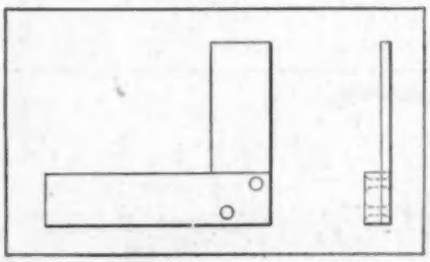
■

Flat-Sided Squares

J. T. TOWLSON
London, England

L-squares are commonly made with the blade held in a saw slot. Since such squares have projections on each side, they are inconvenient on many jobs.

In my experience as toolmaker and fitter, I have found



squares with one side flat to be very handy especially when used in pairs, one right-handed and one left-handed. These can be made more easily than those of the slotted type.

■

Milling Ports in a Valve Bushing and Cutting Steam Ports in Cylinder Bushings—*Discussion*

J. T. TOWLSON
London, England

In reading the articles by Max Schwarze and M. H Westbrook, under the titles given above, on page 273, Vol. 72, of the *American Machinist*, I must confess that I have gotton a bit mixed up between the two methods of executing such an every-day job as milling ports in valve and cylinder bushings. As a practical miller, I desire to become acquainted with the difficulties appertaining to the usual method of doing such work, that method being mounting the bushing on a rotary table (such as is furnished by makers of milling machines), rotating the table automatically, and cutting the ports with an end mill of a diameter matching the openings.

It is evident that Mr. Schwarze has ignored the value

of the rotating table, and uses longitudinal feed, losing time by the difference between the distance the work is required to travel by straight and circular feeds, respectively. It is also evident that Mr. Westbrook does his port cutting by spoiling an expensive, four-fluted cutter, and by drilling unnecessary holes. He, too, uses longitudinal feed, thus losing time and ignoring the value of the worm-driven, rotating table. No machine shop worthy of the name should be without one.

In my opinion, rotary, circular tables of from 20 to 30 in. in diameter are worth their weight in gold in a general machine shop. The shop in which I have been employed for the past 25 years, has half a dozen of the 20-in. size, and they are always in demand. I think it would be considerably to the advantage of both Mr. Schwarze and Mr. Westbrook if they would look into the matter of rotary tables, without further delay.

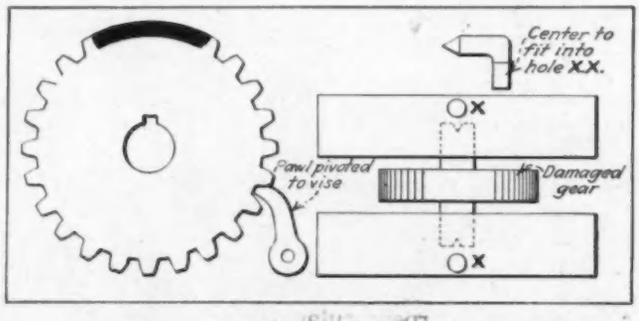
■

Finding the Centers of New Teeth in a Repaired Gear—*Discussion*

RICHARD H. KIDDLE
Kiddle's Machine Tool Works

In an article under the title given above, on page 812, Vol. 72, of the *American Machinist*, H. Moore tells how he found the centers for the new teeth in a repaired gear. Having found them, he formed the tooth spaces by filing.

It seems to me that I would have cut the tooth spaces



How the gear could be held for cutting the tooth spaces in the shaper

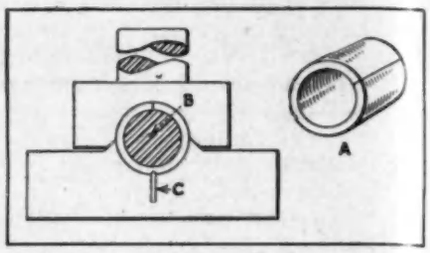
in a shaper. The gear could be held on a mandrel between centers in the vise jaws, locating the position for the cut by means of a pawl engaging one of the original tooth spaces, as shown in the illustration. A clamp should be used to hold the gear stationary while the cut is being made. With a tool of the proper form in the toolpost, the depth of cut could be regulated by the graduated collar on the down-feed screw. If the jaws of the vise are not provided with centers, they could easily be made and holes drilled to receive them, as shown in the illustration.

■

A Kink in Die Making

DONALD A. BAKER

It is sometimes necessary to bend rings, or cylinders, from flat stock, somewhat as shown at *A*. Such parts are usually bent in two operations, the first in a die that bends the blanks into U-shape, and the second in a die that bends the ends inward and around a mandrel, so that they can be struck a solid blow by the punch. In most cases, however, difficulty will be experienced in making the joints tight, since the natural spring of the metal will cause them to open after the bending operation.



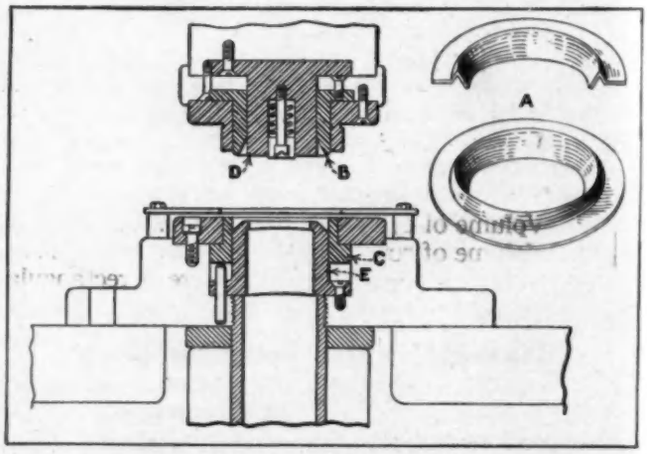
A remedy for this condition, when the absolute smoothness of the outer surface is not essential, is shown by the die in the illustration, where *B* is the mandrel around which the parts are to be bent. It is assumed, of course, that parts have been bent into U-shape in a previous operation. In the bottom of the die is inserted a piece of thin, hardened steel, as at *C*, the top of which is ground to an included angle of 90 deg. A piece of an old hacksaw blade is ideal for the purpose. The final blow of the punch forces the metal at the bottom of the part onto this piece of steel, and the indentation made by it is sufficient to slightly stretch the metal in the part. The result is that the ends remain close together, making the joint tight.

■

Press Tools for Making Bezels

CHARLES H. WILLEY
Asst. Plant Supt., Hoyt Electrical Works

The tools shown in the illustration are for producing bezels, such as the one indicated at *A*, used for holding the glasses over the dials in a certain type of dash ammeters. These tools make the bezels complete in one



Dies for making bezels for ammeters

operation—blanking, forming, and cutting out the center disks. The stock is 0.010-in. brass in rolls, and is fed through the stripper plate in the lower die. The section *B* in the upper die contacts with the stock and starts the forming of the beveled edge. Then the punch *C* blanks the work and holds it on the lower die until the punch *D* cuts out the disk in the center. The inside bevel is formed over section *E*. The disks fall through the tube in the center of the lower die.

Measurement Conversion Tables

Mensuration Formulas

Area of section of square of flat bar or rectangle or parallelogram	width x thickness or length x breadth
Area of triangle	half base x perpendicular height
Area of circle	square of the diameter x .7854
Area of circle sector	number of degrees in arc x square of radius x .008727
Area of circle segment	area of sector with same arc minus area of triangle formed by radii of the arc and chord of the segment
Area of equal circle	area of square x 1.273
Area of sphere (ball)	square of diameter x 3.14159; or area of its great circle x 4
Area of trapezoid	half the sum of the two parallel sides x the perpendicular distance between them
Regular polygon	half the perimeter x the perpendicular distance from the center to any one side
Area of octagon	square of diameter of inscribed circle (distance across flats) x .828
Area of hexagon	square of diameter of inscribed circle (distance across flats) x .866. or one side x 2.598
Area of ellipse	product of axes x .7854; or half product of axes x 3.14159
Area of cylinder	length x circumference of body plus area of both ends
Circumference of circle	diameter of circle x 3.14159
Circumference of circumscribing circle	side of square x 4.443
Circumference of equal circle	side of square x 3.545
Diameter of circle	circumference of circle x .31831
Diameter of circumscribing circle	side of square x 1.1142
Diameter of equal circle	side of square x 1.128
Diameter across flats in hexagon	diameter across corners divided by 1.156
Diameter across flats in octagon	diameter across corners divided by 1.082
Side of inscribed square	diameter of circumscribing circle x .7071 or circumference of circle x .2251
Side of an equal square	diameter x .8862; or circumference x .2821
Volume of prism	Area of base x perpendicular height
Volume of wedge	length of edge plus twice length of base x one sixth of the product of the height of the wedge and the breadth of its base
Volume of cylinder	area of base x perpendicular height
Volume of cone	area of base x one-third of perpendicular height
Volume of parallelogram (square or rectangular)	area of cross section x length
Volume of sphere (ball)	cube of diameter x .5236

Specific gravity of steel (carbon)	(approx.) 7.85
Specific gravity of gray cast iron	(approx.) 7.22
Specific gravity of white cast iron	(approx.) 7.65
Specific gravity of high speed steel	8.45 to 8.75
1 cubic inch of cast iron weighs	(approx.) 0.26 lb.
1 cubic inch of wrought iron weighs	(approx.) 0.28 lb.
1 cubic inch of steel (carbon) weighs	(approx.) 0.283 lb.
Weight per foot of square or flat section (steel)	area x 3.4
Weight per foot of round section (steel)	square of the number of ¼ inches in the diameter divided by 6
Weight per foot of octagon (steel)	weight per foot of same size Round Bar x 1.0547
Weight per foot of hexagon (steel)	weight per foot of same size Round Bar 1.1026

Courtesy of Heppenstall Company

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VOL. 73 NO. 2

Dividing Engineering Meetings by Subject or by Industry

ONE OF the problems of those in charge of meetings of technical societies is to secure the attendance of those who should be interested in the subjects to be discussed. This problem is made more difficult by the present tendency to segregate meetings into sections by industries rather than by engineering subjects.

All matters pertaining to hydraulics, for example, under the proposed plan would be presented at the same section meeting whether the papers dealt with hydraulic feeds for machine tools, hydraulic presses for forming or forging, hydraulic lifts for bridges, elevators or garages, or hydraulic brakes for automobiles. Advocates of this plan contend that we usually get more new ideas from men in other lines who use the same or similar mechanisms than from those in our own line. In the case of hydraulic feeds, for example, one may be thoroughly familiar with all the known feeding devices, and yet know little about other application which may contain valuable suggestions for use in one's own line.

It is felt by some that by segregating meetings by engineering subjects in this way instead of by industries, engineering societies may avoid the commercial tendencies to which some members object and at the same time increase their usefulness.

General Electric Has An Unemployment Insurance Plan

A REAL contribution to the solution of one of the most vexing problems of management—unemployment—is being made by the General Electric Company's offer to its employees of a plan for job insurance. Without going into details it may be said that the plan goes into effect in any plant only by the affirmative vote of 60 per cent of those who have been employed a year or more. It is not to be forced on any plant without good evidence that a substantial majority favor it, thus recognizing the advisability, or the right, of employees having a voice in matters of this kind.

Briefly, the plan creates a fund by collecting one per cent of the actual weekly or monthly earnings for a period of three years. If, however, the employees' earnings are below 50 per cent of his average full-time earnings, no deductions are made. Up to 3 per cent of the fund is to be available for the relief of employees or former employees. Up to 27 per cent can be loaned to members, while the remaining 70 per cent, together with all emergency contributions, is for unemployment payments. The General Electric Company will contribute an amount equal to that collected from the employees.

An important feature of this proposal, perhaps the most important, is the recognition by one of our leading firms that unemployment is a problem with which management must concern itself in the future. It is a recognition of the change in thought on civic ethics from the time when the sole object of management was to earn dividends, regardless of the welfare of the employees or the community.

When enough big business managers recognize unemployment in the same light as they do accidents, we shall have as great improvement in the reduction of casualties resulting from one as from the other. This new move of the General Electric Company is a step toward placing the worker in a better position than ever before.

Why Not Use T.C. for Tungsten Carbide?

ABBREVIATIONS, while abhorred by some, are welcomed by many, and as a result we see an increasing number in use. Unfortunately there are as yet no uniform abbreviations in general use although standards have been proposed and will probably be adopted.

Among the common abbreviations are "tenths," "dural," C.R. for cold rolled, and H.S. for high speed steel. By the same token, why not use T.C. for tungsten carbide, and save in time, ink, and telephone tolls?

In every discussion of cutting tools, tungsten carbide is on everyone's tongue at frequent intervals. Its four syllables do not flow readily from the tongue. T.C. is much more fluent and just as expressive. Or if we insist on saying cemented tungsten carbide why not use C.T.C.?

SHOP EQUIPMENT NEWS

Putnam Rotary Slitting Machine

THE Putnam Machine Works, Division of Manning, Maxwell & Moore, Inc., Fitchburg, Mass., has developed a slitter designed to trim the sides or to slit into multiple strips mild steel plates or sheets up to and including $\frac{5}{16}$ in. thick. The whole machine is mounted on a substantial base of fabricated steel. Two housings carry a pair of arbors on which are mounted cutters that perform the slitting work. Two sets of feed rolls keep the sheets and strips flat and straight while going through the cutters. Feed rolls and cutter arbors are geared together and driven through a reducing unit by a motor mounted at end of machine. Two operators are commonly required—one at the entering and one at the discharge end.

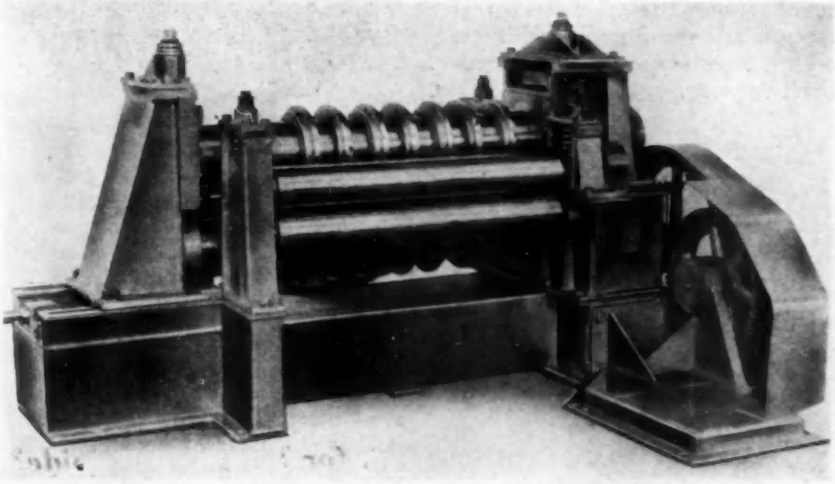
Both cutter arbors are driven, are 10 in. in diameter, and are made with extreme accuracy, being ground to size and tested to run perfectly true. Care is taken that the arbor key is parallel to the line of center and is held in a tight fit. The top arbor is mounted in a slide which is adjustable for different thicknesses of material.

A new method is used to hold the cutters on the arbor. The cutters are the plain disk type without projections, which makes them strong and inexpensive. These cutters are mounted on hubs between shoulders. The hubs are then slid on the arbor from the end, the fit being very exact. An elongated key way in the hubs binds on the top of the arbor key, and the cutter is held rigidly in place. This method allows the operator to make a quick and easy set-up or change in width of cut.

Feed rolls are mounted parallel to and on both sides of the cutter arbors. They are of hardened steel, accurately ground and tested. They are arranged with vertical adjustment so they may be set open the desired width for various thicknesses of stock. This allows the sheet or plate being cut to enter between the feed rolls in the easiest manner. The rear feed rolls are on a swinging arm so they may swing out of the way when resetting cutters.

Anti-friction bearings are used throughout the slitter. These bearings are mounted in heavy housings which are well ribbed and constructed of fabricated steel parts. The machine is arranged with open-end arbors, the open end having a removable bearing. One end housing is on ways and is easily removable by means of a screw and ratchet, leaving one end of the arbors entirely open for changing the cutters.

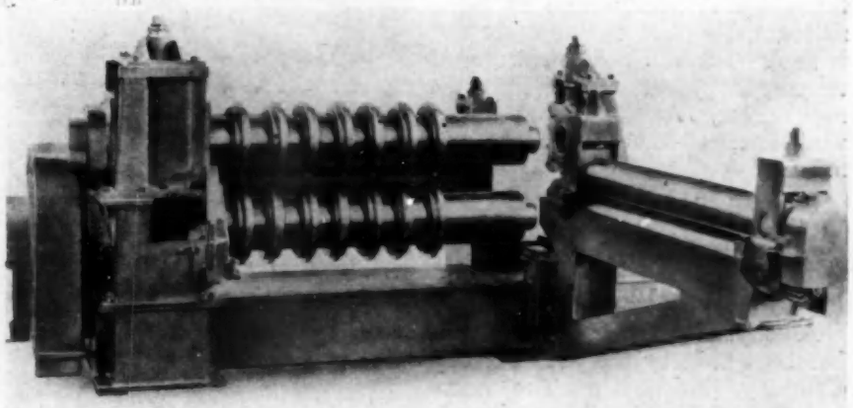
The stripper finger bracket also swings out of the way for changing cutters. When resetting cutters, it is not even necessary to swing this bracket, for the fingers may be loosened up and moved to new locations without moving the frame. This machine is furnished in four sizes for handling sheets 24, 36, 48, and 60 in. wide.



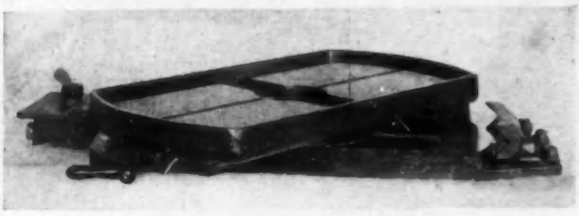
Bed, housings, and brackets are of fabricated steel construction in this Putnam Rotary Slitting Machine

Brown & Sharpe Nos. 2 & 13 Standard Index Bases

To its line of milling machine attachments, the Brown & Sharpe Manufacturing Company, Providence, R. I., has added the Nos. 2 and 13 standard index bases designed for use on its plain milling machine with automatic or semi-automatic table movements. Both sizes are similar in design and operation. They consist of a heavy base bolted to the table of the machine. The swivel rotates



Attention has been given to facilities for the adjustment and removal of cutters



Brown & Sharpe No. 13 Standard Index Base

Brown & Sharpe No. 2 Standard Index Base for plain milling machines with automatic or semi-automatic movements

on a heavy pivot and is locked and held rigidly in position by a taper plunger operated by a hand lever. It can be indexed through a full circle, with working positions at 0 and 180 deg. The contact surfaces are scraped assuring correct alignment and rigidity. Various types of fixtures, both regular and special, are adaptable for use with this attachment.

The standard index bases are furnished with a reversible tongue for aligning them on the table of the milling machine. A tongue slot for aligning fixtures is cut in the swivel. Fixtures are bolted and doweled to the swivel in accordance with the requirements of the job to be done.

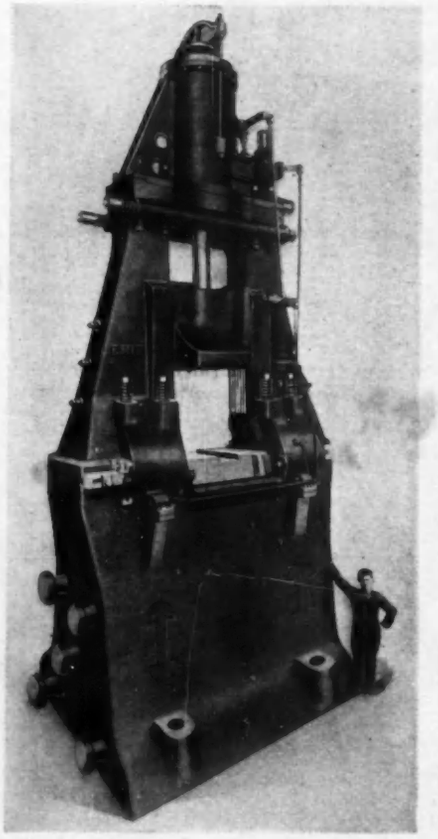
The most important use of the standard index base is on jobs where semi-automatic table movements are used, and where the loading time is equal to or greater than the cutting time. It is arranged with a fixture at each end of the swivel, and while the work in one fixture is being milled, the fixture on the other end is being loaded. Upon completion of the cut, the swivel is indexed and the machine is again set in operation. The work is then removed from the idle fixture.

Erie 25,000-Lb. Drop Hammer

A drop hammer rated at 25,000 lb. has been built by the Erie Foundry Company, Erie, Pa. The actual weight of the ram, rod and piston is 27,000 lb. Assembled, this hammer has a standing height of 35 ft. 6 inches. The sow block measures 60 in. from front to back; die space in the clear between the guides 52 in., and the ram, 54 in. from front to back. This hammer has a 32 in. cylinder with a piston rod of 11 in. in diameter.

This machine is being used for production of large die-forgings, an 8-in. flange gate valve for 900 lb. pressure being forged from a 2,000-lb. billet. The finished forging weighed 1,750 lb., and the over-all length, 31½ in., the height, 24 in., and diameter of the flange, 18½ inches.

Among the improvements on the hammer are: positive guide alignment, which does away with ram binding and assures a full-weight blow; a V-type sow block, which seats tighter in the anvil with every blow from the ram; an extended box section frame that provides greater strength and maximum bearing area, and the latest type of motion valve, which stops steam leakage and waste.

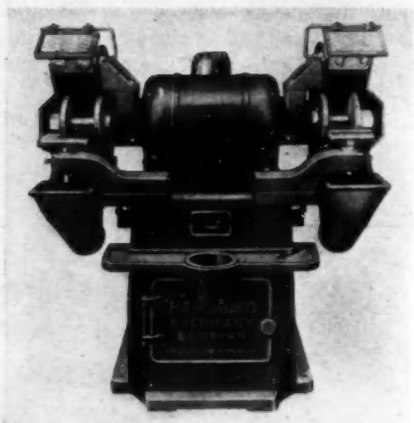


Erie Steam Drop Hammer, which has a 25,000 lb. rating and stands 35 ft. 6 in. high

Hammond Type W Heavy-Duty Grinders

Two sizes, 5 and 7½ hp., of the Type "W" heavy-duty grinder have been placed on the market by the Hammond Machinery Builders, Inc., Kalamazoo, Mich. This grinder is intended for production service on heavy tool grinding. It is fitted with a totally inclosed, 40 deg. C motor, fitted with a motor air cleaner and equipped with push button control. The automatic motor starter is mounted on the inside of the pedestal door for convenience of inspection and resetting.

Oversize ball bearings are protected from dirt and dust by labyrinth seals.

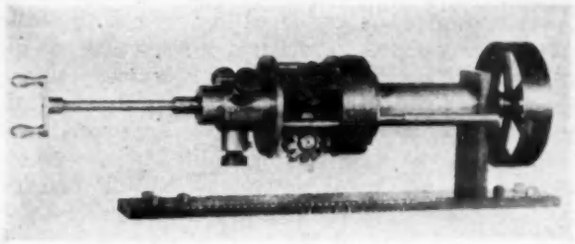


Hammond Type W Heavy-Duty Grinder for heavy tool grinding

They have convenient oilers. The spindle is made of chrome-nickel steel, ground and balanced. Wheel guards are made of boiler plate steel and comply with American Standards Association specifications, have hinged doors for quick removal of grinding wheels and are equipped with spark shields and shatterless glass eye shields. They are adjustable to compensate for the wear of the grinding wheels. Adjustable and demountable toolrests are standard equipment.

Boyer Internal Milling Head

Internal milling, slotting, perforating and splining operations can be performed with the internal milling head announced by the Earle G. Boyer Company, 2nd & Fisher Aves., Philadelphia, Pa. This head can be furnished in sizes ranging from 6 in. diameter up to 24 in. diameter by



Such operations as internal milling, slotting, perforating, and splining can be performed with the Boyer Internal Milling Head

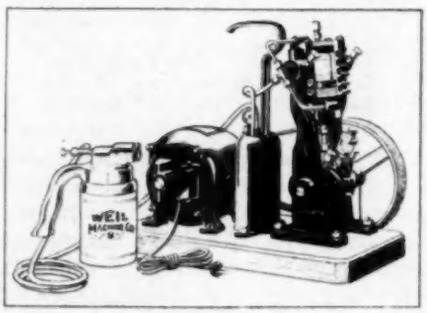
½ in. increments with expansions ranging from 1½ in. in the small sizes to 6 in. or even larger in the larger sizes.

This internal milling head is sturdy and powerful. It is mounted on ball and thrust bearings with nickel-chrome steel gearing. By means of a single pulley or spindle drive through an inclosed gearbox, it will operate automatically and develop three distinct, separate motions; namely, milling, expanding, and traveling, either in unison or individually, and in addition, will drive single or multiple cutters in two, three four, or six directions at the same time. Because of its rigid construction it is claimed to remove large quantities of metal.

The principles incorporated in this internal milling head may be changed to meet the particular needs for a special job, and the head may be furnished as special or standard equipment on milling machines, or horizontal boring mills, with several systems of mounting; such as one in which the work is held rigid and stationary, and in which the head proper travels, and one in which the head is held stationary, and in which the work travels.

"Oscillator" Paint Spraying Apparatus

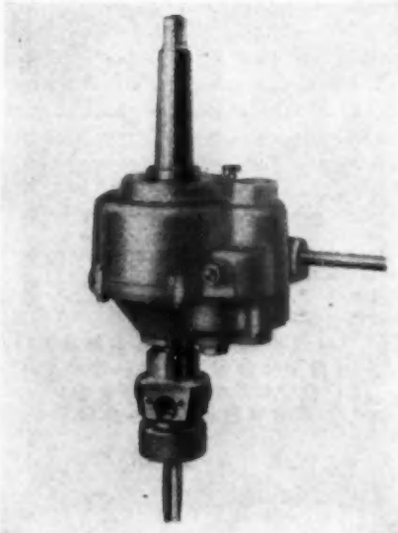
All oil and lead paints and lacquers can be sprayed by means of the "Oscillator" paint spraying equipment. This apparatus has been placed on the market by the Weil Machine Company, 2648 E. Fort St., Detroit, Mich. An even flow of air is furnished by the single piston, which compresses air both on the upward and downward strokes. The bearings are adjustable and the piston is also adjustable in connection from the eccentric. The cylinder oscillates backward and forward.



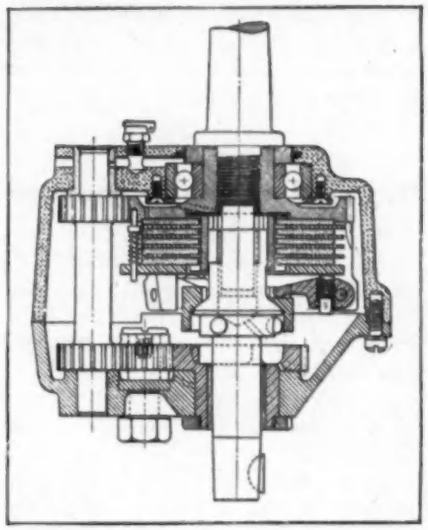
As shown, the "Oscillator" equipment consists of a motor mounted on the base with the compressor and the accumulator with a gage, and a vacuum type spray gun and paint container.

"Ettco" No. 5 Tapping Attachment

A large size sensitive tapping attachment, which has a capacity up to ⅞ in. in steel and 1 in. in cast-iron, has been developed by the Ettco Tool Company, Inc., 594 Johnson Ave., Brooklyn, N. Y. This tapper, known as the No. 5, uses a multiple-disk clutch for driving the tap in and a ball-type positive clutch for reversing the tap at a ratio of 1.7 to 1. As shown by Fig. 2, the multiple-disk clutch consists of alternate plates of vulcanized fiber and saw steel. Pressure is applied to the plates by three fingers arranged so that pressure on the drill press lever causes an amplified pressure against the plates with a ratio of 8 to 1. Even pressure on the fingers is assured by the use of a ring which sets on a spherical surface of the spindle to which the tap holding chuck is attached. Because of the even pressure, the clutch is smooth in action. The "evener" ring as used in this multiple-disk clutch allows lateral float.



Capacity up to ⅞ in. in steel and 1 in. in cast iron is embodied in the "Ettco" Sensitive Tapping Attachment



Cross-section of the Ettco Tapping Attachment, showing the multiple-disk clutch for driving the tap and the ball-type positive clutch for reversing it

By means of a set of gears, the reversing clutch runs left-handed while the machine spindle rotates right-handed. Three balls are used, which are indented in the tap holding chuck spindle. When the drill press lever is reversed to take the tap out, these balls drop into sockets in the reversing clutch.

An important feature is the use of a single ball bearing to hold the case of the tapper in place. Because it has a very small amount of side shake after being used for a while, this bearing allows the entire case of the tapper to have an angular floating movement, which compensates for inaccuracies of the tap or the line up of the work.

The tap is started in the hole with a gentle pressure on the drill press

lever. Should the tap be in danger of breaking, the clutches will slip since they are proportioned for this. The clutch slips when the tap hits the bottom of a blind hole. There are no adjustments of any kind necessary, although provision is made for adjusting the wear of the clutches. The case of the machine is made with an aluminum top and a cast-iron bottom. All journals are hardened and ground and run in bronze bushings. It was also necessary to develop a large-size tap-holding chuck with a capacity up to 1 in. to fit this attachment, in addition to the other sizes now being made.

Rego "Red Star" Regulator

Balancing of the action of the first and second stages and the use of large size diaphragms for both stages are features of the "Red Star" regulator announced by The Bastian-Blessing Company, 241 E. Ontario St., Chicago, Ill. The first stage is a complete regulator functioning at any desired pressure. It is not merely a fixed pressure check-valve or reducing-valve. It is claimed that the regulator will give a perfect flame as

"Red Star" Duplex Regulator for welding gases, which is claimed to maintain a perfect flame over a long period

set originally without variation over a large period and until practically all of the gas in the cylinder is consumed.

The regulator may be used simultaneously for cutting and welding. A separate, high-pressure, needle-valve outlet on first stage line is used for the cutting torch. No restrictions to free flow of gas are found inside of the regulator so that no gas is left in the cylinder.

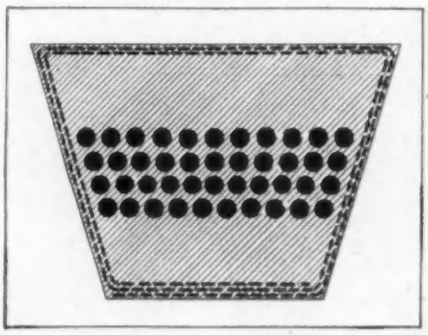
Forged metal parts employed for the body are claimed to weigh one-third as much as brass. Complete assembly is lighter than standard single-stage regulators. The gages are built into the body, giving full protection against breakage and all parts hug closely to the tank. The top is flush to the tank valve, thus protecting the regulator and gages from damage by passing conveyances.

Hexagonal adjusting-screw handles, instead of wing-bolts, permit delicate adjustment of gas flow. A lock nut on the second stage adjusting screw holds the adjustment despite vibration. Both regulator valve seats are removable from the outside without disassembly of the regulator. A chromium-plate finish has been applied to the instrument.

Worthington Multi-V-Drive

A "Multi-V-Drive," developed in conjuction with the Goodyear Tire & Rubber Company, has been placed on the market by the Worthington Pump & Machinery Corporation, Harrison, N. J. This drive consists of a number of endless molded V-belts running in V-grooved sheaves. It combines a rubberized cord V-belt, impervious to dust and moisture, with an improved V-grooved sheave. The load-carrying members are high-grade cotton cords arranged in parallel lines and concentrated about the neutral axis. Among the claims made for this belt are: high power capacity, long flexing life, low stretch, accurate cross-section, and high-quality rubber.

Each sheave is grooved, machined and finished so that the grooves present a smooth surface on which the belts run. The wedging action between the belts and the grooves results in a slipless, powerful grip. Transmission of about 99 per cent of the applied power is claimed at high speed ratios, over short centers, without idlers. It is claimed that should one of the strands of the "Multi-V-Drive" break the remaining belts will carry the load until replacement is made.



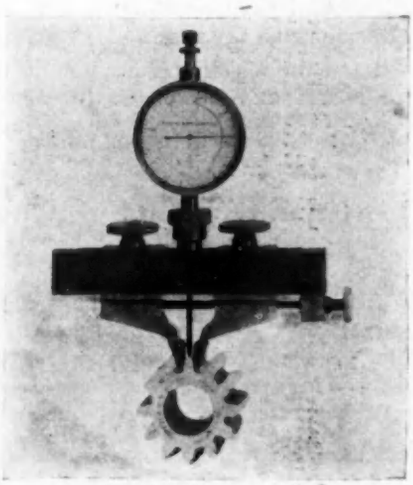
Cross section of Worthington "Multi-V-Drive" Belt, showing how the cotton cords are arranged in parallel lines and concentrated about the neutral axis

Other claims made for the belt are: quiet operation; neatness; small floor space; constant speed; elimination of idlers, lubrication, and belt dressings, higher speed ratios; and freedom from breakdowns.

Sykes Model E Gear-Tooth Comparator

An improved model of the Sykes gear-tooth comparator, known as the Model E, has been placed on the market by the Farrel-Birmingham Company, Inc., 344 Vulcan St., Buffalo, N. Y. This gear-tooth comparator uses the chordal method and eliminates the necessity of having to use an instrument with two scales, one at right angles to the other. The instrument is a development of the Sykes gear-tooth vernier caliper.

Both jaws of the instrument are movable, but the dial indicator spindle is stationary. This makes for more convenient setting. In addition, the



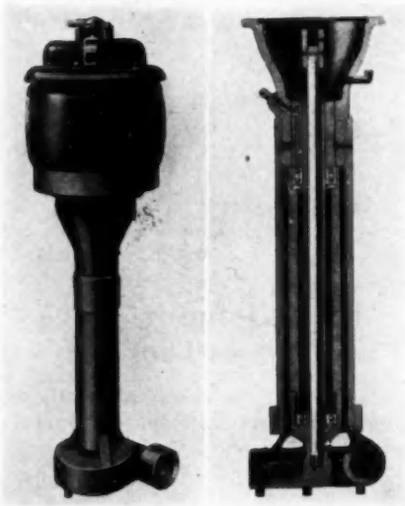
Sykes Model E Gear-Tooth Comparator which uses the chordal method. The jaws are movable

dial gage is adjustable in the holder, permitting the gage to be raised or lowered. Consequently it is not necessary to change the plunger or spindle of the dial gage for gaging fine and coarse pitch gears. Another

improvement is that the jaws are interchangeable for different pressure angles.

Brownie Coolant Pump

A vertical coolant pump especially adaptable to centerless grinders or for coolant purposes has been announced by the Tomkins-Johnson Company, Jackson, Mich. This centrifugal pump uses no packings and is said to be troubleproof. It is simple in design and sturdy in construction. The No. 1 size has a capacity of 50 gal. per min. with a maximum lift of 15 ft. A ½-hp. motor drives direct at a speed of 1,725 r.p.m. The height over all is 19⅝ in., including the motor, and the pump can be placed in an 8½-in. circle. The outlet pipe is 1¼ in.



Brownie Coolant Pump available in two sizes to pump 50 and 15 gal. per minute at maximum lifts of 15 and 10 feet

The No. 2 pump has a capacity of 15 gal. per min.; a maximum lift of 10 ft., a ¼-hp. motor; a 1-in. outlet pipe, and height, including the motor, of 19⅛ in. There is no bottom or pan under the impeller to collect grit or chips. The drive shaft, impeller, and protector tube are made in one unit. With the intake at the top, the coolant is never forced upward between the housing and protector tube and never comes in contact with the ball bearings. The coolant pump can be furnished with or without a motor or with a driving pulley if desired, and can be furnished made from acid-resisting metal.

Relnberg-Jacobson Rotary Die Filing Machine

Three-speed V-belt drive giving from 1,800 to 900 r.p.m. at the spindle is employed on the rotary die filing machine announced by the Rehnberg-Jacobson Company, Rockford, Ill. This machine is powered by a ¼-hp., G. E. motor with snap switch control. S K F bearings support the spindle top and bottom and the collet chuck will take up to ⅜ in. file shanks.

The table, which is 10x10 in., is clamped on the column with an additional screw adjustment below the table. Maximum distance from the table to the spindle nose is 4½ in., and from the column to the spindle 7 in. Table tilts with screw adjustment 10 deg. from horizontal. The machine stands approximately 32 in. high, and weighs about 345 lb. The bench space required by the unit is 12x20 inches.

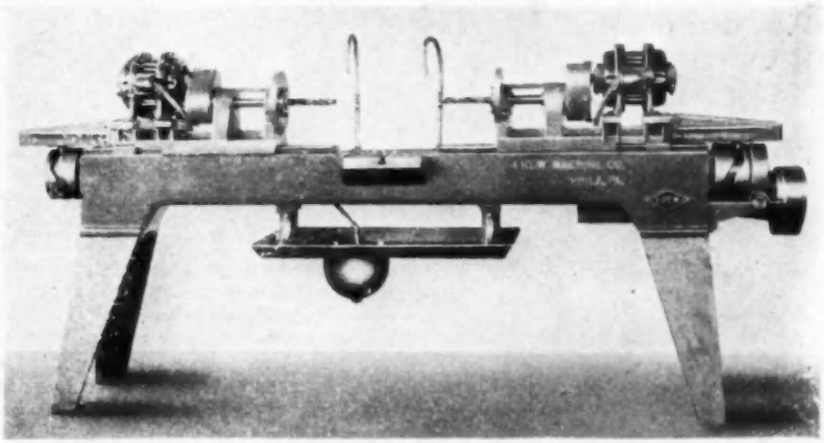
A tilting table is featured

Frew No. OO-C Duplex Horizontal Drilling Machine

Drilling and reaming operations on opposite ends of metal products can be taken care of on the No. 00-C duplex horizontal drilling machine announced by the Frew Machine Company, 124 West Venango St., Philadelphia, Pa. Movement of the heads is mechanically controlled by cams at either end of the bed, so that the operator is required only to unload and load the fixture.

Each head has its own motor and a separate motor is provided for driving the feed. The bed is a one-piece, box-type casting, provided with dovetailed ways on which the heads slide. The fixture plate in the center of the bed is provided with T-slots for supporting the fixture. Running through the bed is a heavy shaft, turning in Timken bearings, and carrying a cam at each end. The cam shaft is driven by means of a worm and worm gear through a suitable gear reduction and pick-off change gears are provided so that the rate of feed can be varied. The feed motor is mounted on a bracket attached to the back of the bed and geared to the worm gear unit.

The heads have a long gibbed bearing surface with space for mounting



Cam controls on the Frew No. 00-C Duplex Horizontal Drilling Machine permit drilling and reaming operations to be carried out automatically on opposite ends of the metal products

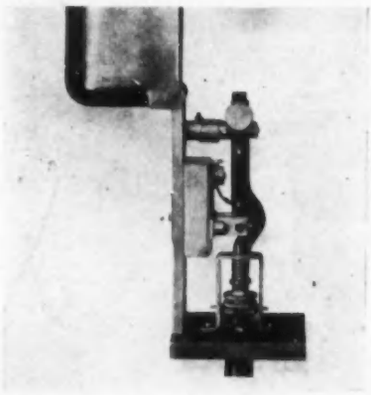
the motor, which is geared to the spindle. Attached to the rear of the head is the cam slide, which carries the cam block, and which is adjustable for varying the distances between spindle ends. The front ends of the head units have a large flat surface to which multiple heads can be bolted.

The alloy steel spindles with No. 3 Morse tapers are carried in Timken tapered roller bearings taking care of both radial and thrust loads. All gears are provided with cast-iron guards. As the movement of the head is entirely automatic, a high rate of production can be obtained with this machine.

This machine is an outgrowth of the Model O duplex hand drilling machine described on page 186, Vol. 70, of *American Machinist*.

General Electric Thermostat Control for Melting Pots

A quartz rod thermostat for controlling the temperature of melting pots for use with lead, tin, babbitt, solder and other white metals, has been developed by the General Electric Company, Schenectady, N. Y. The thermostat consists of an inclosed switch and a nickel-chrome iron tube extending from its base and surrounding a steel piston and quartz rod. The thermostat has a temperature range of 450-950 deg. F., and will control temperatures to within plus or minus 14 deg. F. of its setting. The contacts are designed to carry any current necessary to operate standard control panels.



A quartz rod thermostat for controlling the temperature of melting pots, as introduced by General Electric

TRADE PUBLICATIONS

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CADMIUM PLATING. The Grasselli Chemical Co., Inc., Cleveland, Ohio, has published a booklet on its cadmium plating process "Cadalyte"—its development, advantages and operation.

CUTTERS AND REAMERS. The Goddard & Goddard Co., Detroit, Mich., has issued bulletin No. 102 on its inserted, serrated-blade cutters and expansion reamers, giving descriptions, specifications, photographs, and prices.

DRILLS, GRINDERS, AND BUFFERS. The United States Electrical Tool Co., Cincinnati, Ohio, has published catalog No. 29, as of April 15, 1930, giving prices and specifications of the various drills, grinders, and buffers of its manufacture. Tool kits are also illustrated.

FLEXIBLE SHAFTS. The Stow Manufacturing Co. Inc., Binghamton, N. Y., has issued bulletin No. E-125 on Stow flexible shafts and motor driven tools.

GEARS. The Boston Gear Works Sales Co., North Quincy, Mass., has issued Catalog 49 on the various gears, chain, and speed reducers of its manufacture. The catalog consists principally of tables and prices of these products.

GENERAL ELECTRIC CATALOG. The General Electric Co., Schenectady, N. Y., has issued catalog GEA-600A, a publication issued every two years. It supersedes all previous catalogs issued by the company with the exception of those dealing with railway, mine, and industrial supplies and merchandise products. The book is 2 in. thick and contains 1146 pages, 8x10½ in. It is profusely illustrated and thumb-indexed in 16 sections. In the indexes the products are classified both by subjects and by catalog numbers.

GRINDING WHEEL DRESSERS. The Desmond-Stephan Manufacturing Co., Urbana, Ohio, has issued a catalog on "Mechanical Abrasive and Diamond Grinding Wheel Dressers," showing the correct methods of using these tools and giving specifications of the various sizes and cutters available.

GRINDING CEMENTED TUNGSTEN CARBIDE. The Carborundum Co., Niagara Falls, N. Y., has issued a bulletin "Some Information on Grinding Cemented Tungsten Carbide," giving the characteristics of the material, the grinding problems, the grit or grain of the grinding wheels, grades, and factors affecting the grinding wheel action. Photomicrographs of the various surfaces produced are included.

LUBRICATING DEVICE, MECHANICAL. Lubrication Devices, Inc., Battle Creek, Mich., has issued a booklet "Farval Dualine Heavy-Duty Centralized System of Lubrication," giving the particulars on the system which will pump both oil and grease for heavy-duty machinery.

LUBRICATING DEVICE, MECHANICAL. The Bowen Products Corporation. Auburn, N. Y., has issued catalog No. AF-72 on "Bowen Positive Lubrication for Industrial Machines." A complete discussion is given of the advantages and operation of this system.

SCREW CONVEYOR DRIVES. H. W. Caldwell & Son Co., 2410 W. 18th St., Chicago, Ill., a subsidiary of the Link-Belt Co., has issued booklet No. 1191 describing the "Caldwell" screw conveyor drive and containing many photographs of typical installations. Specifications of the various drives are included.

SCREWS, "UNBRAKO." The Standard Pressed Steel Co., Jenkintown, Pa., has issued a very well illustrated bulletin on its "Unbrako" screws and also giving miscellaneous screw data and prices. Benches and power transmission accessories are also illustrated.

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Foster-Johnson Valve Seat Tool

A tool for removing air compressor valve seats without chipping or burning them has been placed on the market by the Foster-Johnson Reamer Company, Elkhart, Ind. This tool will not damage the bushings and

Foster-Johnson Valve Seat Tool ready to be inserted in bushing to effect its removal

there is no danger of ruining the threads in the pump. It will also replace the bushing tight without distorting the valve seat.

The tool incorporates a socket wrench that is locked firmly in place on top of the bushing and cannot slip off. The upper end of the tool is machined to accommodate a large wrench so that sufficient leverage can be applied to remove the tightest bushing. Two sizes are provided.

NEWS OF THE WEEK

U. S. Machine Exports Decline in May—Back to Civil War Pensioning?

PAUL WOOTON
Washington Correspondent

WASHINGTON, D. C., July 9—Exports of machinery in May were valued at $83,054,208. This represents a decline of $7,500,000 in the value of exports as compared with April and a decrease of $12,500,000 as compared with May of 1929. Exports of electrical machinery and apparatus, however, showed an increase in May over April and over May of 1929. The total under that heading was $10,457,499. The same is true of industrial machinery. In May, exports were valued at $23,918,704. They were slightly less than that figure in April and considerably less in May of 1929.

Exports of construction and conveying machinery show a slight decrease as compared with April, but are more than $1,000,000 greater than those of May, 1929. The figure for May, 1930, was $2,680,648. Mining and pumping machinery moved in the export trade in larger volume in May than was the case in May, 1929, but shows some $300,000 falling off as compared with April. The May figure is $4,819,265. May also saw increased exports of power driven metal-working machinery. The total value of these shipments was $4,404,364. This is nearly double the volume of exports in May of last year and is a slight increase over April exports. Exports under the heading "Other metal-working machinery" were valued at $630,818, which is practically the volume of exports in May, 1929, and only a few hundred dollars less than shipments in April, 1930.

There was a material decline in exports of textile, sewing and shoe machinery to $1,763,758. There was a slight decline abroad of sewing machines but under the heading of "Other industrial machinery" there was a slight increase in the volume of exports. In May their value was $7,105,592 as compared with $6,979,478 in May, 1929, and $6,604,246 in April, 1930.

Comparing some of the quantities exported in May of this year, as compared with the corresponding month of 1929, there were: 254 engine lathes exported as against 54; 57 as against 25 turret lathes; 94 as against 105 other lathes; 75 as against 73 thread cutitng and automatic screw machines; 21 as against 24 knee and column type milling machines; 80 as against 32 other milling machines; 40 as against 42 gear cutting machines; 41 as against 27 vertical drilling machines; 120 as against 14 radial drilling machines; 90 as against 160 other drilling machines; 49 as against 43 planers and shapers; 19 as against 21 surface and grinding machines; 78 as against 47 external cylindrical grinding machines; 28 as against 47 internal grinding machines; 182 as against 95 tool grinding, cutter grinding and universal grinding machines; 1,938 as against 2,140 pneumatic portable tools; 2,778 as against 1,028 chucks for machine drills.

BECAUSE of the curious timidity on the part of the average member of Congress the country is faced with the unlovely prospect of returning to the pension system. It will be a worse pension system than that which grew out of the Civil War. There always was material opposition to any pension legislation which applied to only a part of the states. Now that check is gone. A well-organized portion of the population in all states would benefit from World War pensions.

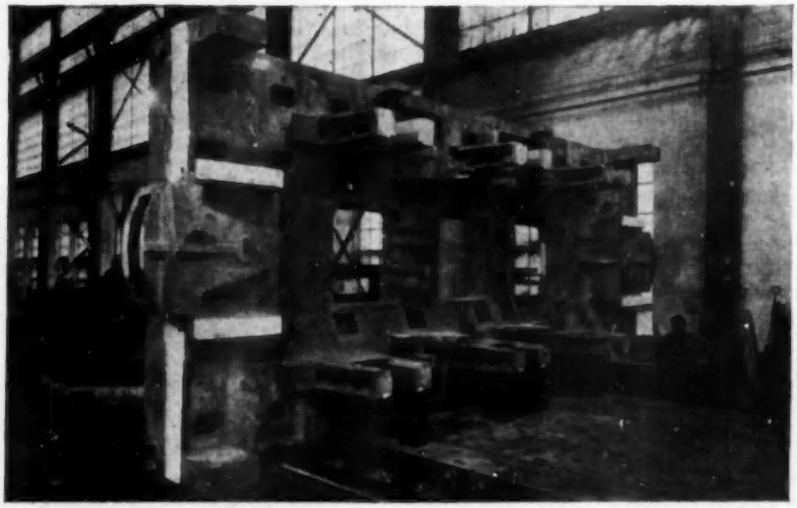
All recognize that those who sought unsound legislation for the veterans constitute a minority but politicians learned long since that they have comparatively little to fear from an unorganized majority.

Of the 4,800,000 American called to arms, 2,500,000 never left the country. Some of them never left their home town. The high water mark of Civil War pensions came over 50 years after the close of that war. With nearly 5,000,000 potential pensioners on the federal treasury list, a steady increase in the tax rate is foreseen.

WITH the filing of a majority and a minority report, the Senate Judiciary Committee apparently has done all that it can this session on the anti-injunction bill. The bill is designed to limit the use of federal injunctions in labor disputes. After the attorney general declined to inform the Senate as to his views on the constitutionality or the effectiveness of the measure, the committee met and reported the bill out with an unfavorable recommendation. This unusual procedure was adopted because the majority of the committee members felt that despite the fact that they were opposed to the measure, the subject treated upon was of such importance that the Senate body should be allowed to consider it.

In most cases, where the majority of a committee is opposed to a bill, the measure is not reported out but is

BEDS FOR LOCOMOTIVES



A 68,000-lb. industrial locomotive bed, cast as one unit for the Mack-International Company by the Birdsboro Steel Foundry & Machine Company. Truck pedestals were cast integral with the bed. The unit was on the track at the A.R.A. convention

shelved. While it is agreed by those interested in the proposed legislation that it will be virtually impossible to obtain action this session, it is planned to make the bill the unfinished business for next session. This cannot be done, however, until the adjournment resolution has been passed. Whatever is the unfinished business when the Senate adjourns will be the first legislation taken up in the December session.

According to the views of the majority of the committee, the problem is one relating largely to state courts.

Aeronautical exports took a bound for the better during May. Valuation of aircraft, engines, and parts and accessories, except tires, reached the highest peak of this year. All three classifications showed an appreciable increase over the exports during April.

The largest rise was shown in the "airplanes, seaplanes, and other aircraft" classification. Exports of engines continued a steady progress which they have shown during the spring months. Aircraft parts and accessories, except tires, showed an export valuation of $279,051 for May. During April $134,234 worth of parts were shipped out as contrasted to $186,929 in March.

There were no jobs last spring for 2,300,000 people who are usually on the job. They were still looking for work when the census enumerator tagged them during April. This figure is an estimate computed from preliminary returns in the unemployment census covering about one-fourth of the country's population. The tabulation made by the census bureau reveals that by actual count there were 574,647 persons in 756 counties and 75 cities, not included in the county total, who could not get work—any work. They constituted two per cent of the total population of the territory covered, which was 29,264,480. Undoubtedly the number of unemployed would have been larger if it had included those who could not find work in their regular occupation but had hit on something else in the meantime.

The number of unemployed, as enumerated by cities, was greater in percentage to the city population than the tally made in the counties.

Removal of the ban placed by the State Department on the sale of airplanes to Soviet Russia, is being considered. It has been stated that the Department may withdraw its objections if it can be shown that the equipment desired can be procured elsewhere. The case arose over the voluntary action on the part of the Glenn H. Martin Company of Baltimore in asking the State Department if it had any objection to the sale of airplanes to Russia. The State Department replied that it does object to the selling of these planes to Russia.

As the result of this incident, members of Congress have asked the State Department to reveal the source of its authority to prevent such transactions. In reply, State Department officials contend that their authority in such cases is implied but not actual.

Perhaps the outstanding characteristic of the French machinery industry is the degree to which it is divided into small scattered units, according to Trade Commissioner Thomas Butts, Paris, in a report to the Department of Commerce. There are more than 6,000 plants, of which only 20 occupy more than 1,000 workmen. Only about 1,000 plants employ more than 100 workers each; the remainder, 5,000 plants, occupy less than 100 workmen each. The geographical distribution of the French machinery plants is of the widest.

France exports mostly low-priced general purpose machinery and buys expensive production equipment, chiefly of American origin. The principal French markets are her colonies and Belgium and Poland. Germany is the principal source of supply, having shipped 83,596 tons of equipment to France in 1929, including 4,770 tons of textile machinery and 5,810 tons of machine tools.

The American machine tool trade with France has changed greatly in character since pre-war years and even since the early post-war years. The United States formerly sold mainly general purpose equipment in this market. That class of business has now nearly ceased and France buys from us principally specialized high-production equipment. Several French machine tool makers are now manufacturing production machines, but there is on the whole a greater "spread" between American and French made machine tools than there was before the war. The French, handicapped by a very much smaller domestic market and often unfamiliar with the latest production methods have not been able to keep abreast of American technical progress in this regard.

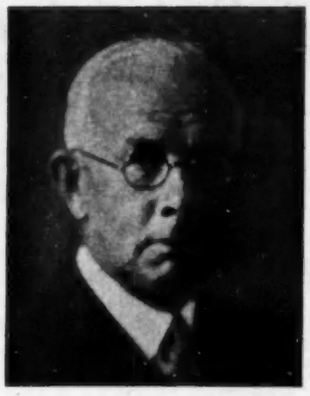
India's nationalists have nothing against the United States nor goods made in the U.S.A. but the turmoil incident to the clamor of the Swaraji for independence and more recently the boycott against British goods in particular and all foreign-made goods in general, has had a disturbing effect upon our export trade with the empire.

Normally, India is a $50,000,000 market. The total depends to some extent upon the ratio that obtains from year to year between the price of American and Indian cotton. Exports to India in 1929—a good year—had an aggregate value of $55,359,000. The total of $16,649,000 for the first four months of this year indicates that a slump is in prospect as the import movement normally is heaviest in the early months of the year and the total for the corresponding period of last year was $20,875,000.

The Commerce Department's trade advisors are inclined to doubt whether this decline in Indian purchases of American goods will reach serious proportions.

Carl Johnson to Head U. S. C. of C. Department

Pres. William Butterworth, of the Chamber of Commerce of the United States, has announced the membership of the departmental committee which will have charge of the Chamber's Department of Manufacture activities for the coming year. Carl A. Johnson, president, Gisholt Machine Co., Madison, Wis., will serve as chairman and Harry B. Gilmore, secretary of the Western Electric Company, New York City, as vice-chairman. Other members designated are: James D. Cunningham, C. S. Duncan, Lammot duPont, E. F. Fitch, L. S. Horner, Francis E. Kamper, John A. Law, Morris E. Leeds, P. W. Litchfield, D. C. Lowles, Floris Nagelvoort, and Theodore Swann. Carl A. Johnson and Francis E. Kamper are now representing manufacture on the Board of Directors of the National Chamber. L. S. Horner, Lammot duPont, and P. W. Litchfield, are also on the directorate of the Chamber. E. W. McCullough is manager of the department.



CARL A. JOHNSON

Ford Announces Expansion Plan

An expansion plan for the current year amounting to $30,000,000 has been announced by officials of the Ford Motor Company, and work involving $24,000,000 of this total is already begun or about to start. Plans for the expenditure of the remaining $6,000,000 are in preparation and specifications are in the hands of architects. The principal item in the program is the construction of new assembly plants to cost $18,000,000, among which are the Edgewater, N. J. plant, which is nearing completion, the Seattle, Wash., and Richmond, Calif., plants, and three others for which sites have not been decided upon as yet. It is expected that one of these will be located in Cleveland. The remainder of the sum will be utilized in improving rubber plantations and in building a water tunnel, intake house, and pump house.

N.M.T.B.A. Bulletin on Lathe Spindle Noses

Many users of engine lathes, turret lathes, and other machines with rotary spindles have apparently misunderstood the present status of the standardization of spindle noses for these tools. Bulletin No. 805 of the National Machine Tool Builders' Association, recently issued, states that though a standardization committee has been appointed and is now functioning, there is as yet no national standard. The bulletin continues:

"It is not desirable to establish a national standard until and unless it is well demonstrated that the construction adopted will meet all the requirements of the user in giving a firm attachment of the tool-holding or work-holding elements, and also enabling the user to change these elements quickly.

"Therefore, if users ask for a 'proposed' or a 'contemplated' standard spindle nose, they should be told that any of the suggestions heretofore made may be changed before long, even though some companies now use some of these suggested forms."

San Salvador School Requests Tool Catalogs

The National School of Industries (Escuela Nacional de Industries) recently established in San Salvador, was brought into being for the purpose of instruction in the various kinds of machinery and their uses which might be practicable in developing the industries of that country. The primary purpose of the school, as stated by one of the directors, is to teach the students the best way of selecting machinery and their practical application. American manufacturers, if they care to do so, may mail machine catalogs to this school, or to the Director, J. Mayans, San Salvador. The school is not in the market for the purchase of machinery. The list of catalogs desired includes those on Diesel engines, tin plate utensil manufacturing equipment, oxygen and hydrogen generating apparatus, tin can making machinery, electric ovens, and a variety of machines for manufacturing miscellaneous products.

Anti-Aircraft Show At Aberdeen on Aug. 15

The Air Corps, Coast Artillery and the Army Ordnance Corps, will hold the fifth annual anti-aircraft show at the Aberdeen Proving Grounds on August 15, according to a recent announcement. The latest types of fire-control equipment, including directors, height finders, and transmission systems, will be tested, together with tests in connection with the recently standardized 3-in. gun and mount, and various other guns.

Amtorg Purchases Show Decline

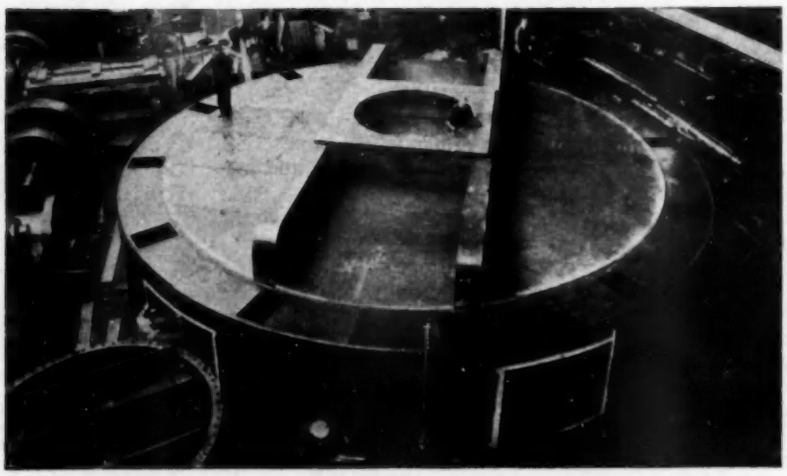
Orders placed by the Amtorg Trading Corporation, New York City, in this country during May for shipment to the U.S.S.R., amounted to $3,098,814—a decline of about 5 per cent from those of the previous month and of nearly 3 per cent from those of May of last year, according to the "Economic Review of the Soviet Union," the publication of the Amtorg Company. April of this year showed a large drop as compared with March. The sharp decline in the Amtorg purchases is claimed to come as a result of a number of factors, among which the problem of credits is most significant. For the first eight months of the fiscal year (October 1, 1929-May 31, 1930), the Amtorg's purchases of American goods totaled $66,339,000, representing a gain of $42,123,000, or 174 per cent, over the previous year.

Stability of Earnings Shown in Study

The most significant feature in the trend of wages in the United States in recent years is the stability of hourly and weekly earnings, according to the National Industrial Conference Board, New York City, in a study just completed entitled "Wages in the United States, 1914-1929." The study compares wages, hours, and employment in 1914 and in the ten-year period 1920-1929.

"In general," the report states, "at the beginning of this 10-year period, wages had advanced very sharply over the pre-war level; during the depression of 1921-1922 they were considerably reduced but not to the pre-war level. The subsequent business recovery resulted in a further rise which was more marked at the beginning than at the end of the period. The last six years have been characterized by comparative wage stability, although, on the whole, the tendency has been slightly upward." Despite the unusual commotion in the business world which occurred last October, the year 1929 showed no marked change from the stable wage conditions of preceding years. Hourly earnings in manufacturing industries at the close of the year stood at 58.2 cents, as compared with 57.5 cents in the preceding January. Weekly earnings withstood the business shock less successfully and in December averaged about $1.25 less than at the high point in October, 1929. They were still, however, above the annual average for the previous year.

According to the study the average number of hours actually worked per wage earner in manufacturing industries in 1929 was 48.6 per week, as compared with 51.5 in 1914. The nominal or full-time work week in manufacturing industries in 1929 was 49.6 hours, a reduction of almost 5½ hours since July, 1914. Speaking of the future trend the board says: "What the trend will be in the near future cannot be predicted. It may be safe to assume, however, that whatever wage changes may occur will be found more in weekly rather than in hourly earnings, inasmuch as past experience has taught that, when adverse business conditions make reduction in payrolls necessary, curtailments in hours and various operating economies are preferable to drastic reductions in wage rates."



BUILDING A MODERN ELECTRICAL GIANT

Assembling the ventilating hood on the casing of the 47,000-kva. hydro-electric generator for the Spier Falls Station. It is 43 ft. in diameter, 24 ft. high, weighs nearly a million lb., and is being built by G.E.

Aviation Becomes Monthly Magazine

Aviation, a McGraw-Hill publication, heretofore published weekly, will become a monthly with a weekly news service to be known as *Aviation News* as a supplement, effective with the August issue, to be published on July 25. The first issue of *Aviation News* will appear July 12. *Aviation* is the American aeronautical industry's oldest magazine and is now in its sixteenth year.

BUSINESS ITEMS

The Kingston Products Co., Kokomo, Ind., and the Kokomo Stamped Metal Co. will be consolidated, and the equipment of the latter moved to the plant of the former. John Reuss, who has been treasurer and general manager of the stamped metal company, will become sales manager for the toy division of Kingston products. Manufacturing and other divisions of the stamped metal company will be placed under executives now in charge of those divisions at the Kingston plant. J. P. Johnson is president.

Officials of Western Steel Products, Ltd., announce the formation of a company to be known as Corporate Steel Products, Ltd., with head office in the city of Montreal, for the purpose of centralizing administration, facilitating and co-ordinating certain departments of the business, and enabling the organization to effect extensive economies in operation. J. L. Riley, formerly manager of the sheet steel department of the United States Steel Products Corporation of New York, will be in charge of purchasing for the entire organization.

The A. M. Byers Co. is completing its Ambridge, Pa., plant to be devoted to the production of wrought iron by the Aston process. A formal opening is expected around the latter part of this month.

The Wright Manufacturing Co., Carson City, Mich., has been incorporated with $100,000 capital to manufacture wood and metal articles.

The Continental Can Co., New York, will erect a factory adjoining the Campbell Soup Co.'s main plant at Camden, N. J., to supply the latter company's entire container requirements there, as well as those of other canners in that vicinity. The Camden plant will be of five or six stories, and will employ between 500 and 600 employees.

The Vilter Manufacturing Co., Milwaukee, has increased its capitalization from 600 of $100 par shares to 9600 no-par shares and in addition added 10,800 shares of $100 par preferred stock. No public offering will be made.

The Republic Steel Corporation, Youngstown, Ohio, has placed in operation the first of its new electric welding tube mills. The second mill will be ready for commercial operation within 60 days. The capacity of the next mill will be 8 to 16-in. pipe. That of the original mill was 4 to 8-in.

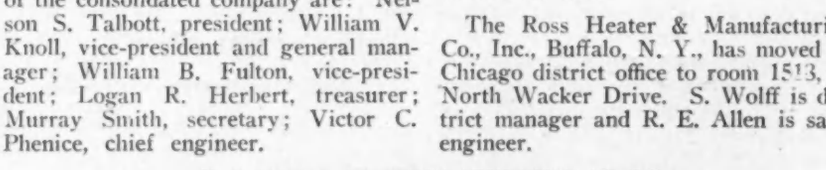
The North & Judd Manufacturing Co., New Britain, Conn., has purchased the entire property and patents of the O. B. North Co., New Haven Conn. Business of the O. B. North Co., which has been operated in receivership, will be moved to New Britain.

The Mid-West Machine Co., Dayton, Ohio, has purchased the Fulton Engineering Co., Middletown, Ohio, according to a recent announcement. Officers of the consolidated company are: Nelson S. Talbott, president; William V. Knoll, vice-president and general manager; William B. Fulton, vice-president; Logan R. Herbert, treasurer; Murray Smith, secretary; Victor C. Phenice, chief engineer.

The John A. Roebling's Sons Co., Trenton and Roebling, N. J., recently invited the members of the Port of New York Authority and a number of officers of the Chase National Bank, New York City, to inspect its plant, where the cables are being manufactured for the interstate bridge to connect New York with Fort Lee.

The Ross Heater & Manufacturing Co., Inc., Buffalo, N. Y., has moved its Chicago district office to room 1513, 20 North Wacker Drive. S. Wolff is district manager and R. E. Allen is sales engineer.

U. S. NAVAL OFFICERS STUDYING AT G.E.



Five post-graduate naval officers are taking a short summer training course in business administration and manufacturing methods at the General Electric plant in Schenectady. Standing, left to right—Lt. James H. Rodgers and Lt. Francis X. Forest. Seated, left to right—Lt. George C. Weaver, Lt. Wm. W. Anderson and Lt. Oscar Stiegler

The Chas. H. Stehling Co., Milwaukee, maker of leather and tanning machinery, has bought the rights to two farm machines formerly manufactured in Milwaukee by Stanley Plazek, the inventor, under the name of the Dependable Harvester Corporation. Mr. Plazek will become associated with the Stehling company. Plant and offices are situated at 401 Fourth St. George T. Stehling is president and manager.

The Fort Worth (Tex.) Tank & Culvert Co., has been organized to fabricate tanks, culverts, and other metal products by M. A. Gay, president; E. M. Stephens, vice-president, and M. A. buchanan, secretary-treasurer. A plant 50x100 ft. has been completed at 1100 North Commerce St.

The Union Carbide & Carbon Corporation has a series of developments under way at Boncar and Hawks Nest, W. Va., including three large electric generating plants. Metallurgical products will be manufactured at the Boncar plant, including ferro alloys of different kinds essential to the manufacture of steel, and steelite.

The American Chain Co. has acquired the entire capital and assets of the Hazard Wire Rope Co., one of the eldest manufacturers of wire rope in the United States, with a plant at Wilkes-Barre, Pa.

Incorporation is announced of the British Ropeway Engineering Co. of Canada. The controlling interest is owned by the Anglo-Canadian Wire Rope Co., Ltd., and the British Ropeway Engineering Co., London, England. The president is G. H. Atkinson, and the vice-president, D. W. Clarke, Jr.

Burton, Griffiths & Co., Ltd., London (England), machine-tool dealers, have changed their address to Montgomery Street, Sparkbrook, Birmingham, England.

The Chemical Equipment Co., Inc., 2441, 2457, and 2459 So. Western Ave., Chicago, Ill., has moved its general offices and factory to Montpelier, Ind.

The Spicer Manufacturing Co. has acquired the universal joint business of the Superior Universal Products Company, Bowling Green, Ohio. The company will take over tools, patterns, and inventories of the Bowling Green organization and the business will be concentrated in Spicer's Toledo plant.

The Taylor Detroit Manufacturing Co., Detroit, has been incorporated with $100,000 capital to manufacture and deal in automobile parts and accessories.

Standard Castings of Cincinnati, Inc., Cincinnati, Ohio, has been incorporated with $35,000 and 330 no par shares.

The Canadian Warren Pink Co., with headquarters in St. Catherines, Ont., has opened a branch at 215 West Fourth St., Vancouver, B. C. The company is planning additions to the plant, when it will manufacture as well as assemble. J. E. Elliott, formerly of Elliott-Teetzel Co., is Vancouver manager.

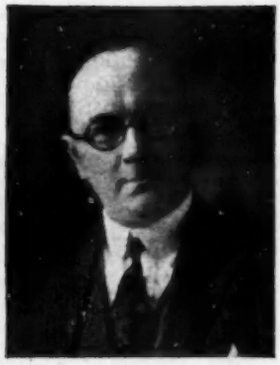
The Warner Gear Co., subsidiary of the Borg-Warner Corporation, Chicago, has acquired a 75-acre tract of land at Muncie, Ind., where construction of a new plant has been started. The new plant with equipment is expected to cost $2,000,000 and be in operation by Aug. 15.

The Toronto (Ont.) Industrial Commission is informed that the Austin automobile is to be assembled in Toronto in the near future and that later these British cars will be manufactured in the Toronto area. This development in the motor car industry is being brought about by the Canadian Austin Car Co., Ltd., a Canadian company organized for the purpose, which has leased a building in Toronto where it will start operations. The parent concern, the Austin Co., is located in Birmingham, England.

Articles of incorporation have been filed with the secretay of state in Indianapolis by Farm Tools, Inc., having a principal place of business at Evansville, Ind. The company is formed "to manufacture or produce harvesting or agricultural machines." The company has an initial capital stock of 5,000 shares having a par value of $100 each preferred, and 50,000 shares having no par value, common. The first board of directors is composed of Richard Rosencranz, Adolph Volderauer, and Cloyd Hines.

Kratz & McClelland, San Francisco, have been appointed agents in northern California for the G. H. Williams Co., Erie, Pa. The San Francisco company will carry a complete stock.

The Manufacturers' Association of Hartford County, Conn., elected as



president on June 12, Clayton R. Burt, president and general manager of the Pratt & Whitney Co., Hartford.

The Wood & Bishop Co., has acquired the Noyes & Nutter Manufacturing Co., Bangor, Me. G. H. Nutter, president of the latter company, will resign.

The Albany (N. Y.) Hardware & Iron Co., at a meeting of the board of directors on June 30, elected the following officers: William H. Gick, president; William C. Dearstyne, vice-president and manager of sales; Harold L. Warner, treasurer; and William E. Foskett, secretary.

The Gustave Fox Co., Cincinnati, Ohio, has changed its firm name to the Fox Co. This is done for brevity, and there will be no change in personnel.

The Triumverate Super Safety Air Craft, Inc., Norwich, Conn., is in the process of organization. J. F. Cooley, aviation engineer, has reported favorably on the proposal, which is to be backed by local capital.

The Frigidaire Corporation, Dayton, Ohio, has appointed Edward B. Newill, mechanical and electrical engineer, vice-

president in charge of engineering. Mr. Newill joined the General Motors Radio Corporation last October as vice-president in charge of engineering.

The Russell Manufacturing Co., 1442 South Michigan Ave., Chicago, has moved into its new building at 1901-03 Indiana Ave. The company will service its distributors in what are known as its Chicago and Northwest divisions.

The Brazil Stamping & Manufacturing Co., 3244 West Lake St., Chicago, recently leased a 1-story factory building at Laramie Ave. & West 65th St., comprising 25,000 sq.ft. of working space.

The Canadian Foundry Supplies & Equipment Co., Ltd., Montreal, Que., recently awarded the contract for the construction of a $100,000 plant at St. Henri, Quebec.

The General Electric Co., featured an automatic photo-electric door-opener and a scientific laboratory display at the Railway Supply Manufacturers' Association Convention at Atlantic City recently. T. H. Reeves was in charge.

The John Deere Plow Co., recently established a new distribution branch and office in Sioux City, Iowa at Jones Street and the River Road. F. J. Farrington, general manager of the Omaha territory has indicated that the branch will represent an investment of $200,000.

The Winstead (Conn.) Insulated Wire Co. has voted to acquire the plant of the former Empire Knife Co., and will utilize it for expansion.

Munning & Munning, Inc., Memphis & Tioga Sts., Philadelphia, has been incorporated for the manufacture and distribution of electroplating, buffing, and polishing apparatus and supplies. The founders are Peter P., John A. and August P. Munning.

The Reynolds Metals Co., New York City, has purchased the plant and other assets of Lehmaier, Schwartz & Co., Inc., New York City, according to a recent announcement by R. S. Reynolds, president. The Lehmaier Company will be dissolved.

The Eclipse Engineering Co., Newark, N. J., has been incorporated with $100,000 preferred and 2,000 common shares to manufacture and deal in motors.

The Allan Manufacturing & Electrical Corporation, Newark, N. J., has moved to Lawrence, Mass., where it will maintain its executive offices and general plant.

The Port of New York Authority has removed its offices to 80-90 Eighth Ave., New York, N. Y., according to an announcement by J. E. Ramsey, general manager.

The S. & S. Metal Products Co., Covington, Ky., has been incorporated with $36,000 capital to manufacture and sell machinery, furnaces, and other metal products.

The Clay Equipment Corporation, Cedar Falls, Iowa, is completing an addition 80x100 ft. to house its sheet-metal department. Machinery will be placed in the building in a fortnight, Joseph B. Clay, president, has announced.

The Levy & Westwood Machinery Co. has just completed and opened a machine shop and yards on Dufferin St., Toronto, Ont.

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The Blanchard Machine Co., 64 State St., Cambridge, Mass., will close its shop and office from noon, July 26, until August 11 for the annual vacation of the organization.

The Pittsburgh (Pa.) Tube Co. has opened a New York district sales office at 210 E. 45th St., in charge of John V. Kelly, district sales manager.

The Keystone Steel & Wire Co., Peoria, Ill., is planning a 1-story addition to its plant for storage and distribution.

The Ada Exact Level & Tool Co., High Bridge, N. J., has been incorporated with $50,000 capital to deal in tools.

PERSONALS

H. S. Boardman, president of the University of Maine, was elected president of the Society for the Promotion of Engineering Education at the recent annual convention in Montreal, Que. C. F. Harding, dean of the School of Electrical Engineering at Purdue University, was chosen a vice-president, as was also Dean R. A. Seaton of Kansas State University. F. L. Bishop of the University of Pittsburgh was chosen secretary, and W. O. Wiley, of John Wiley & Sons, was chosen treasurer. Members of the council include R. E. Doherty, Augustin Frigon, J. E. McDaniel, F. V. Larkin, T. J. Hoover, W. E. Farnham, and L. E. Akeley.

Ray T. Bayless, for many years associated with the A.S.S.T. as editor of the *Transactions* has been promoted to assistant secretary of the Society in charge of technical activities.

David Bartlett has been appointed Chicago manager for the Alexander Milburn Co., Baltimore.

W. M. Brooks, president and assistant treasurer, E. J. Brooks Co., Inc., Newark, N. J., will succeed the late E. J. Brooks as treasurer. Mr. E. J. Brooks' position as chairman will be left vacant for the present.

William D. Bliss, president of the Bliss Bros. Tool & Die Co., Milwaukee, has been reappointed to the faculty of the College of Engineering, Marquette University, Milwaukee, after a two years absence.

RAY H. MOORE

His appointment as Cleveland District sales manager of the Whiting Corporation was announced in *American Machinist* on July 3

A. J. German, chief engineer of the Scovill Manufacturing Co., Waterbury, Conn., is in Europe attending the World Power Conference.

Josepth Clendenin, sales manager of Guggenheim Bros., New York, is now on a trip to Europe.

F. W. Marshall, president of F. W. Marshall & Co., Pennsylvania Bldg., Philadelphia, sailed on June 17 for a short trip to Europe.

Olin Livingston, former assistant sales manager and advertising manager of the Roller Bearing Co. of America, has been appointed sales manager. L. E. Goodrich has been appointed sales representative in the Atlantic seaboard district. He was formerly connected with the Rollway Bearing Co., Syracuse, N. Y.

RUDOLPH E. PRUSSING

His appointment as Chicago District sales manager of the Whiting Corporation was announced in *American Machinist* on July 3

H. R. McClymont, formerly mechanical engineer with Kerry & Chase, Ltd., Toronto, has joined the staff of the McMaster-Jacob Engineering Co., Ltd., Toronto. Mr. McClymont was formerly chief construction engineer for the Siemens Co. of Canada.

A. P. Cobb has resigned his position as secretary of the New Jersey Zinc Co., New York City, and has been succeeded by R. G. Hudson. Mr. Cobb continues as vice-president, but ill health necessitated the relinquishing of active work.

Ross Mackinnon has been appointed assistant general sales manager of the General Motors of Canada, Ltd. During the last ten years Mr. Mackinnon has been sales manager of the company's Chevrolet and Oakland divisions.

Alan M. Scaife, connected with Wm. B. Scaife & Sons Co., Pittsburgh, Pa., for the past ten years, has recently been elected president.

George W. Sells, assistant manager at Waukegan, Ill., for the American Steel & Wire Co., Chicago, retired on June 6. He had been assistant superintendent of the Waukegan plant and later superintendent of the Joliet, Ill., plant.

E. E. Spencer, president of the Stromberg Electric Co., Chicago, has recently returned from a two months' tour of Europe in which he established sales representation in England, France, Sweden, and Belgium.

J. L. Van Nort has been advanced to sales engineer of the Boston office of the Reliance Electric & Engineering Co., Cleveland.

Scott Turner, director of the U. S. Bureau of Mines, Washington, and vice-president of the A.I.M.E. was designated as a delegate from the U. S. to the second plenary meeting of the World Power Conference at Berlin.

C. B. Vincent, treasurer and chairman of the board of directors of the Torrington (Conn.) Co., has resigned and A. W. Burg, assistant treasurer for seven years, has been elected treasurer. Mr. Vincent is now touring interesting European sections.

George Watson, who resigned on May 15 as sales manager of the Wickwire Spencer Steel Corporation, New York City, has been appointed general sales manager in charge of sales and publicity of the Welding Engineering & Research Corporation, New York City.

Thomas J. Watson, president of the International Business Machines Corporation, New York City, sailed for Europe on June 18, accompanied by Walter D. Jones, former treasurer and comptroller of the company, who has been appointed general manager of the European organization. Mr. Watson will study the company's foreign organization there and the overseas reaction to the new tariff bill.

Charles L. Wood has been elected vice-president of the Carnegie Steel Co., Pittsburgh. He has been general manager of sales for the company since November, 1925. He will continue in charge of sales.

John C. Woodison, formerly vice-president and secretary of E. J. Woodison Co., Detroit, will succeed the late Edward J. Woodison as president.

Charles W. Welch, Jr., of the Metals Sales Corporation, New York, is at present on a motor trip to South Carolina.

Albert G. Zima, until recently identified with the Western Crucible Steel Castings Co., Minneapolis, as metallurgical engineer, is now associated with the development and research department of the International Nickel Co., Inc., New York.

Carl B. Parsons, president of the Parsons Co., Detroit, has been nominated as vice-president representing Passenger-Car Body Engineering of the S.A.E.

Frederick K. Glynn, engineer in charge of operation and maintenance of automotive equipment of the American Telephone & Telegraph Co., New York City, has been nominated for vice-president representing Transportation and Maintenance Engineering of the S.A.E.

John G. Wood, for the past three years in charge of engineering at Olds Motor Works, has been appointed general manager of Muncie Products, a division of General Motors, according to an announcement by D. S. Eddins, vice-president and general manager of the Olds Motor Works.

Rudolph E. Hellmund, chief electrical engineer for the Westinghouse Electric & Manufacturing Co., received the B. G. Lamme Award for 1929 at the A.I.E.E. Convention in Toronto. The

medal is presented annually to the electrical engineer who has shown meritorious achievement in the development of electrical apparatus and machinery. Mr. Hellmund at one time worked with the late B. G. Lamme, donor of the medal.

OBITUARIES

Wm. E. Fulton, retired president of the Fulton Foundry & Machine Co., Waterbury, Conn., died on June 2 in that city, after a short illness.

Alexander Meldrum, 46, inventor and vice-president of the Meldrum-Gabrielson Corporation, Syracuse, N. Y., died in that city on June 25, following a long illness. In 1914 he organized the Crescent Manufacturing Co., and in 1920 the Lowry-Knise Tool Co. was absorbed. In 1921, with Carl Gabrielson the Meldrum-Gabrielson Corporation was formed.

Cyrus Robinson, 61, died on June 30 at his summer home at Pinecroft, West Harwich, Mass. During his career he held many important engineering posts with the American Ship Windlass Co., the General Electric Co., the Jeffrey Manufacturing Co., the Westinghouse Machine Co., M. Guggenheim's Sons, and the American Smelting & Refining Co. He was a member of the A.I.M.E.

Harry C. Stutz, 53, designer and builders of pleasure and racing automobiles, died on June 26 in Indianapolis. Mr. Stutz entered the industry in 1897. He was the founder of the Stutz Motor Car Company of America.

Maurice V. Bresnahan, 77, a director of the United Shoe Machinery Co., and a pioneer in the manufacturing of shoe machinery, died on June 24 at his home in Lynn, Mass. He had been in ill health for seven years.

Clarence W. Dickerson, 70, vice-president and secretary of the Timken-Detroit Axle Co., Detroit, died in that city on July 1 of heart disease. He came to Detroit in 1910 as assistant treasurer of the Timken-Detroit Axle Co.

James J. Mason, 70, associated with the Buckeye Blower Co., the Utica Radiator Co., the Richmond Radiator Co., New York, and the National Radiator Corporation, Johnstown, Pa., during the past 40 years, died on June 29 at his home in Cleveland.

Robert H. Vreeland, 82, former superintendent of the Joseph Dixon Crucible Company, Jersey City, N. J., died in Milledgeville, Ga., on June 25.

Maynard French, 52, head of the Maynard French Steel Co., Cincinnati, until his retirement a year ago, died on June 24 at his home in Glendale, Ohio.

Benjamin F. Haughton, 80, vice-president and treasurer of the United States Pipe & Foundry Co., Beverly, N. J., died suddenly at his home on June 25.

Leonard J. L. Rich, president of the Superior Metal Co., New York City, died suddenly at his home in that city on June 29.

John B. Schmandt, formerly with the Schmandt Foundry Co., Detroit, died recently at his home in that city.

A. Livingston Mason, former president of the Newport Engineering Works, died on June 25 at Bronxville, N. Y.

Laurent B. Levy, 60, president of the Pennsylvania Range Boiler Co., 24th & Washington Sts., Philadelphia, died recently at his home in that city.

FORTHCOMING MEETINGS

INTERNATIONAL CONGRESS FOR GENERAL MECHANICS — Liege, Belgium, Aug. 31 to Sept. 7. For information address Alb. Schlag, 4 Place Saint Lumbert, Liege, Belgium.

NATIONAL MACHINE TOOL BUILDERS' ASSOCIATION—Cost Conference, Hotel Clifton, Niagara Falls, Ont., Canada, Sept. 22-23. Erneest F. DuBrul, 1415 Enquirer Bldg., 617 Vine St., Cincinnati, Ohio, is general manager.

NATIONAL METAL CONGRESS—Twelfth annual Congress and Exposition, Stevens Hotel, Chicago, Sept 22-26. W. H. Eisenman, secretary of the A.S.S.T., 7016 Euclid Ave., Cleveland, Ohio, is director.

AMERICAN WELDING SOCIETY—Annual fall meeting, Congress Hotel, Chicago, September 22-26. W. M. Spraragen, 29 W. 39th St., New York, N. Y. is technical secretary.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Annual fall meeting of Iron & Steel Division and Machine Shop Practice Division, Stevens Hotel, Chicago, September 22-26. P. T. Wetter, 29 W. 39th St., New York, secretary.

AMERICAN INSTITUTE OF MINING & METALLURGICAL ENGINEERS — Annual fall meeting of Iron & Steel Division, Stevens Hotel, Chicago, September 22-26. T. T. Read, 29 W. 39th St., New York, N. Y., is secretary.

AMERICAN INSTITUTE OF MINING & METALLURGICAL ENGINEERS — Annual fall meeting of the Institute of Metals Division, Stevens Hotel, Chicago, September 22-26. W. M. Corse, 29 W. 39th St., New York, N. Y., is secretary.

AMERICAN SOCIETY FOR STEEL TREATING—Annual Convention, Stevens Hotel, Chicago, September 22-26. W. H. Eisenman, 7016 Euclid Ave., Cleveland.

NATIONAL SAFETY CONGRESS—Nineteenth Annual, to be held at Fort Pitt and William Penn Hotels, Pittsburgh, from Sept. 29 to Oct. 3. Metals Section meetings will be held on Tuesday and Wednesday mornings and Thursday afternoon.

AMERICAN GEAR MANUFACTURERS' ASSOCIATION — Semi-Annual meeting, Hotel Clifton, Niagara Falls, Ont., Canada, from Sept. 29 to Oct. 1.

NATIONAL MACHINE TOOL BUILDERS' ASSOCIATION—29th Annual Convention, Hotel Aspinwall, Lenox, Mass., October 13-15. Ernest F. DuBrul, 1415 Enquirer Bldg., 617 Vine St., Cincinnati, Ohio, is general manager.

THE INDUSTRIAL REVIEW

Weekly progress of the machinery and machine-tool business

THE following reports, gathered from the various machinery and machine-tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

NEW YORK

Independence Day, which last week affected machinery and machine-tool buyers, this week affected the dealers. One of them has gone to Scotland on a visit, several others have "Will be back Monday" signs hanging on the doors. There has been no change in the general situation; but no one is unhappy, for no change was expected. No additional lists have been released, and the shortness of the business week allowed little time for closing orders. Prices and deliveries are good. The used tool market is comparatively quiet.

NEW ENGLAND

The present low level of machine-tool distribution in the New England territory becomes more apparent with the approach of the mid-summer dull period. Machine-tool orders are comparatively very few, and show no promise of constructive buying. Inquiries are few in number and usually specify single units. Small tool orders have fallen off, but distribution is regarded as fair from a seasonal standpoint. Good sales of road building and construction machinery are reported, and the electrical utility industry is buying equipment.

Industrial conditions show improvement in spots, but a number of large manufacturers are taking advantage of the summer season to give the entire personnel a week or more of vacation.

BUFFALO

Orders within the last fortnight may best be described as sporadic. There has been nothing which resembles consistently good business and most dealers have resigned themselves to hope for little else within the next month. After that they hope it will improve, but most of the dealers—and this goes for the electrical equipment houses as well—feel that there will be no really good business before September.

The thing which seems to be sustaining flagging spirits is the belief that business will be good this autumn and winter. In the meantime the job seems to consist of hanging on and getting everything ready for a good effort in the fall. Some new inquiries are in but there are few which indicate purchases for immediate delivery.

CINCINNATI

The Fourth of July holiday reduced the bookings of the machine-tool manufacturers of the Cincinnati district, but the average sales for business days remained at about the same level as they had been.

Selling agents report that conditions in local and adjacent territory remain unchanged, the market remaining sluggish and prospects being hard to close. Among the week's purchases was an order for four lathes, to go to Holland.

Among the week's inquiries was a fair-sized list from the War Department, for tools for Wright Field, Dayton, Ohio, among the requirements being seven engine lathes, one turn lathe and two milling machines. It is thought that this order will be placed at once, at least a portion coming to this city. It is also thought that a large inquiry received from Russia, calling for a variety of tools, will be closed soon.

QUIET which contrasts sharply with the noise of Independence Day characterizes the machinery and machine-tool markets of the country. The extremely short week resulting from the holiday, the usual summer slowness, and the general business quietude have combined to push the market to the year's low point. Inquiries are slow, and the used tool market shares the quiet of that for new tools. Prices are being maintained, and deliveries are better than they have been for many months.

NEW YORK reports no additional lists and little business during the week, general conditions being about the same as those of the week preceding. New England sales of road building and construction machinery are good, but most other lines are exceedingly slow. Buffalo orders are sporadic, but a few inquiries are beginning to come in, and optimism is general. Cincinnati sales retained the same level, with four lathes sold to Holland and a fair-sized list of inquiries from the War Department for Wright Field.

CHICAGO places June behind May in point of sales, and inquiries received there are only for single tools. Canadian industries expected to purchase machine tools have undergone a slowing down, although there are some sales to radio, aeronautical, electrical, and agricultural interests. Indianapolis reports most of the small number of sales to industrials, but construction machinery sales have been a season's high spot. Southern District orders were satisfactory, according to report, although there was comparative quietude throughout the district.

CHICAGO

According to most machine-tool manufacturers' representatives and dealers, the month of June fell behind May in the matter of business transacted. Sales were at a very low level with practically every concern engaged in the machinery industry. In one instance, that of a long-established house which acts as selling agent for several lines of standard tools, the writer was told that its business had fallen off to about 50 per cent of what it was this time a year ago, and had dropped approximately 20 per cent within the last month. This, however, is an exceptional, and probably an extreme case. Inquiries being received are mostly for prices on single tools needed for replacement. Where used tools can be employed to advantage they are, in many cases, given the preference over new ones.

CANADA

Comparative quietness has characterized the machinery and machine-tool market in Canada during the last fortnight. Industrial conditions throughout the country are fairly steady but there is a slowing down in some of the departments which directly affect the machine-tool business. Quite a number of the leading automobile plants are taking a brief holiday for inventory purposes. During the last month plants have been operating at between 60 and 70 per cent of 1929 production, which means that they are probably operating on the whole at between 55 and 60 per cent of actual capacity. The steel output for the last month was the lowest for the year, although it compares fairly well with the same period a year ago. Construction and transportation are showing gains in working forces, while mining and hydro-electric projects are also adding to the number of workers under engagement.

Demand for agricultural machinery is picking up slightly but it is by no means satisfactory. Sales of electrical appliances and radio equipment are good and there is also improvement in the aeronautical field. Orders for railway equipment are less numerous and future business in this field will depend largely upon the results of this year's grain crop in the West.

INDIANAPOLIS

Machinery and machine-tool sales in this territory continue to be made, what little volume is sold, to only a few industrials. In fact business in this line is about as low as it has been for years. Some of the large users have curtailed their production to four days a week, some to three, and some have closed entirely, for what they term the vacation period.

The volume of construction machinery sold has been one of the high spots during the current spring and summer and many dealers believe there yet is more to come. The really high light of the year has been the buying on the part of power utilities of special machinery. The gas industry also has been a fairly good customer for the sort of machinery they use.

Some inquiries are being received from mining industry.

SOUTHERN DISTRICT

Quietness characterized the machinery and machine-tool market of this district the past fortnight. Orders for new tools and equipment were reported to be satisfactory, but there is no definite evidence that improvement over this condition will be shown the next two weeks. Natural gas development in Louisiana has been the outstanding feature in the New Orleans territory, but strangely enough it has not reflected, as might be expected, in inquiries from the fields.

While the Houston district continues to show the brightest spot of the entire South, there has been a noticeable recession in inquiries from that area. Birmingham continues sluggish with no material change from the preceding two-week period. The Southeast, too, has shown no change.

Deliveries are satisfactory with prices holding well for both new and used tools. Sales are, for the most part, centered about small-tool business, largely contributed to by machine shops of the independent type. Little inquiry is reported from the railroads, and industrial plants remain quiet.

BUSINESS · BAROMETER

Week of July Fourth usually marks nadir of business year, but prospects appear better

THEODORE H. PRICE
Editor, Commerce and Finance, New York

THE week which includes the Fourth of July generally marks the nadir of the business year in America. Therefore, there is but little change in the outlook to report. Business men are still depressed. Just why, none of them seem able to understand or explain. They simply say that people are not buying goods. They do not have energy left to argue with you when you point out that the country's physical condition is as good as, if not better than, it was at this time last year; that our resources are as large as ever; that our wealth must have been heavily increased by last year's profits; and that we must be suffering from a depression of spirit rather than from a loss of inherent strength or vitality. That we will recover in time there can be no doubt, but we are an impatient people, and everybody is anxious that business should keep marching at quick-step all day and all night. This is impossible for any organization, and until we realize that "Steady, steady, steady, on the 'ard, 'igh road," is the best gait for us to take, we will continue to be subject to these alternations of dejection and exhilaration.

Everything that can be done to facilitate business recovery is being done. In his radio address to the Governors last week President Hoover took occasion to commend the policy of expenditures for public works, and urged the various Governors to use their influence to have such works undertaken and energetically prosecuted in their respective states.

There has been some argumentation over the amount of unemployment. The Census Bureau has put out a statement in which it asserts that only 2,300,000 persons were unemployed when the census was taken. On the other hand, the American Federation of Labor claims that there are nearly 6,000,000 persons unemployed. The truth is probably somewhere between the two figures. There is now no way of ascertaining the facts. It must not be forgotten, however, that in this country there are a good many classified as unemployed who are really idle by choice because they do not need to work in order to make a living.

The extraordinary decline in brokers' loans reported for the month of June, and the cheapness of bank credit which prevailed all last week, are the two most impressive features of the situation. Call loans have been as low as 1½ per cent, and there is talk of a lower rate. The abundance of credit may not have any immediate effect upon business, but sooner or later it must stimulate the business of the country, and the day when this effect will be felt cannot be far off.

So far as distributive trade is concerned it has been quiet, but it is hardly any worse than it was last year. Some of the commodities, particularly silk, cotton, tin, rubber, and cocoa, have commenced to show a better tone. In many quarters a quickened interest in them is evinced.

The steel mills are quiet, and the rate of production is about as it was. The woolen-textile industry is in a better condition, but the cotton mills still complain of their inability to sell their goods, and are shutting down from week to week.

The feature of the business aspect is the sentimental change that has taken place in the last few months. Six months ago everyone was bullish, and it was almost a crime to express an opinion suggesting conservatism. Now the reverse is the case. Everybody is gloomy. Those who are cheerful are considered foolish or misguided; America has committed commercial and financial suicide; and some seem to think that we will have to wait for a new race of young men to grow up before we will recover our business serenity. Sympathy with these views is impossible for the man who has lived long enough to realize the irrepressible resiliency of this wonderful country, and the promptitude with which we recover from such attacks of depression that are similar to the one from which we are now suffering. We have seen several of these attacks, and we have come to believe that their duration is in inverse ratio to their intensity. Applying this mathematical formula to the situation, we conclude that we will soon see a revival of activity and prosperity.

In Europe the final withdrawal of the French troops from the Rhineland has removed one source of international irritation. Tension between France and Italy is said to be worrying the heads of the League of Nations in Geneva, but it is not easy to see at this distance what there is in the issues between those two countries that is worth fighting about. Industrial and commercial leaders from thirteen countries, organized four years ago in what is called "The European Customs Union," are gathered in Paris to consider what may be done in securing tariff solidarity. Little had been heard of this organization, formed to promote trade harmony on the Continent, until the passage of our new tariff law stirred it into activity.

THE BUSINESS WEEK

July 9, 1930

"DEVELOPMENTS of the past week strengthen the conviction that a period of stabilization has set in, in preparation for the process of business recovery. Nothing has occurred to alter the view expressed in last week's issue that this process will become evident, even through blue glasses, at the beginning of August. . . . Our preliminary index of general business activity for this week, with one component estimated, has risen further, from 93.9% of normal to 95.2%. Occasional downward fluctuations may be expected from time to time in the next few weeks, but a return to the low level of the middle of June is unlikely. . . . The general trade indicators as a group have risen sharply, and are within two per cent of normal, while productive activity remains considerably below normal. Commercial loans are increasing with seasonal demand, and the general rate of credit expansion continues considerably above normal and rising steadily. The rate of commodity price decline is below the average of the past year, and in some key markets greater steadiness has appeared. . . . The stock market, too, shows some signs of greater sanity, though still hopelessly out of touch with fundamental business realities. More aggressive open market operations by the Federal Reserve and less cautious support of the wheat market by the Farm Board would help swing the balance more surely and swiftly in the direction of recovery at a critical time."

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THE WEEKLY PRICE GUIDE . . . .

Rise and Fall of the Market

FABRICATED brass and copper dropped about ½c. per lb. at warehouses in the principal cities during the last week. This is in keeping with the declining trend of the raw metals prices, which steadied a trifle last week. Consistent with the decline of production and sales in the iron and steel industry, wage cuts already have been suggested as a means of meeting part of the loss. Aside from a recent reduction in some of the sheet mills, the industry as a whole is opposed to wage decreases at this time, especially since it might induce the consumer to expect too much in the way of further weakening of prices.

(All prices as of July 3, 1930)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern (silicon 1.75@2.25)	$16.69@$18.19
Northern Basic	19.89@ 20.39
Southern Ohio No. 2	19.89@ 20.39
NEW YORK—Tidewater Delivery	
No. 2 Southern (silicon 1.75@2.25)	18.00@ 18.50
BIRMINGHAM	
No. 2 Foundry (silicon 1.75@2.25)	14.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	20.00
Virginia No. 2	18.75@ 19.25
Basic	22.29
CHICAGO	
No. 2 Foundry, local (silicon 1.75@2.25)	19.00
No. 2 Foundry, Southern (silicon 1.75@2.25)	18.20
PITTSBURGH, including freight charge ($1.76) from Valley:	
No. 2 Foundry	19.63@ 20.13
Basic	19.63@ 20.13
Bessemer	20.76

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.50
Cleveland	5.00
Cincinnati	4.50
New York	5.25
Chicago	4.50@4.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots:

Blue Annealed*	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	1.80@2.00	3.35†	3.00	3.40@3.60†
No. 12	1.85@2.05	3.45†	3.10	3.45@3.65†
No. 14	1.95@2.15	3.55†	3.20	3.50@3.70†
No. 16	2.05@2.25	3.65†	3.30	3.60@3.80†
Black				
Nos. 18 to 20	2.25@2.35	3.85†	3.40	3.33@3.70
No. 22	2.40@2.50	4.00†	3.55	3.45@3.85
No. 24	2.45@2.55	4.05†	3.60	3.50@3.90
No. 26	2.55@2.65	4.15†	3.70	3.60@4.00
No. 28	2.70@2.80	4.75†	3.85	3.75@4.15
Galvanized				
No. 10	2.45@2.50	3.90†	3.65	3.55@3.80
Nos. 12 to 14	2.55@2.60	4.00†	3.75	3.65@3.90
No. 16	2.65@2.70	4.10†	3.85	3.75@4.00
No. 18	2.80@2.85	4.25†	4.00	3.90@4.15
No. 20	2.95@3.00	4.40†	4.15	4.05@4.30
No. 22	3.00@3.05	4.45†	4.20	4.10@4.35
No. 24	3.15@3.20	4.60†	4.35	4.25@4.50
No. 26	3.40@3.45	4.85†	4.60	4.50@4.75
No. 28	3.65@3.70	5.10†	4.85	4.75@5.00

*Light Plates. †Up to 3,999 lb.

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. butt	56.02%	43.48%	53.3%	42.3%	57.3%	44.8%
3½ to 6 in. lap	52. 6%	40.06%	50.8%	37.8%	53.9%	41.4%

WROUGHT-STEEL PIPE LIST

Size, Inches	List Price per Foot	Diameter in Inches—External	Diameter in Inches—Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28
8	2.50	8.625	8.071	.277

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at New York warehouse in lots of less than 100 ft. or 100 lb.:

Thickness—Decimal	B.w.g. and Fractions	Outside Diameter in Inches—½	⅝	¾	⅞	1	1⅛	1¼
		Price per Foot						
.035″	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049″	18	.17	.18	.19	.20	.21	.23	.25
.065″	16	.19	.20	.21	.22	.23	.25	.27
.083″	14	.20	.22	.23	.24	.25	.27	.29
.095″	13	.21	.23	.25	.26	.27	.29	.31
.109″	12	.22	.24	.26	.27	.28	.30	.32
.120″ or .125″	11	.23	.25	.27	.28	.29	.31	.33
.134″	10	.24	.26	.28	.29	.30	.32	.34

MISCELLANEOUS—Warehouse base prices in cents per lb.:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	4.65	4.65
Spring steel, heavier	4.00	4.00	4.00
Coppered Bessemer rods	6.05	6.00	6.20
Hoop steel	4.25†	4.00	3.75†
Cold rolled strip steel	6.25	6.00	6.10
Floor plates	5.10†	5.30	5.00†
Cold fin., round or hexagon‡	3.40	3.65	3.35
Cold fin., flat or square‡	3.90	4.15	3.85
Structural shapes	3.30†	3.00	3.10†
Soft steel bars	3.25†	3.00	3.00†
Soft steel bar shapes	3.25†	3.00	3.00†
Soft steel bands	3.75†	3.65	3.20†
Tank plates	3.30†	3.00	3.10†
Bar iron (2.75 at mill)	3.24	3.00	3.00
Drill rod (from list)	60%	55%	50%

*Flat, ¾-in. thick by ¾-in. wide. †Up to 3,999 lb., ordered and released for shipment at one time. ‡Cold finished steel, shafting and screw stock.

Electric welding wire at New York warehouse—⅜, 8.35c. per lb.; ⅛, 7.85c. per lb.; 5/32 to ½, 7.35c. per lb.

METALS

Warehouse Delivery Prices in Cents Per Lb. for Small Lots:

Copper, electrolytic, New York			13.50
Tin, Straits, pigs, New York			32.00@33.00
Lead, pigs, E. St. Louis	5.15	New York	6.25@ 7.25
Zinc, slabs, E. St. Louis	4.10	New York	6.25@ 7.25

	New York	Cleveland	Chicago
Antimony, slabs	10.00@10.50	10.25	11.50
Copper sheets*	21.75	21.75	21.75
Copper wire*	14.50	14.12½	14.12½
Copper, drawn, round*	20.25	20.75	20.75
Copper tubing*	24.00	24.00	24.00
Brass sheets, high*	18.75	18.75	18.75
Brass tubing, high*	23.75	23.75	23.75
Brass rods, high*	17.00	17.00	17.00
Brass wire, high*	19.25	19.25	19.25

*Mill, base.

SHOP MATERIALS AND SUPPLIES

METALS—Continued

	New York	Cleveland	Chicago
Aluminum ingots, 99%	24@25	24.30	23.30*
Zinc sheets (casks)	10.25@10.75	11.75	10.11
Solder (½ and ½)	25.00	23.50	24@26

Babbitt metal, delivered in case lots, New York, cents per lb.:

Genuine, highest grade	50.00
Commercial genuine, intermediate grade	37.00
Anti-friction metal, general service	31.00
No. 4 babbitt, f.o.b.	11.00

*At warehouse

NICKEL AND MONEL METAL—Price in cents per lb., base, f.o.b. Huntington, W. Va.:

	Nickel	Monel Metal
Sheets, full finished	52.00	42.00
Sheets, cold rolled	60.00	50.00
Strip, cold rolled	55.00	45.00
Rods, hot rolled	45.00	35.00
Rods, cold drawn	50.00	40.00
Tubing	75.00*	90.00†
Angles, hot rolled	50.00	40.00
Plates	52.00	42.00

*Seamless. †Welded.

OLD METALS—Dealers' purchasing prices in cents per pound, f.o.b. cars:

	New York	Cleveland	Chicago
Crucible copper	9.50@ 9.75	9.00	8.75@ 9.25
Copper, heavy, and wire	9.25@ 9.75	8.50	8.00@ 8.50
Copper, light, and bottoms	8.50@ 8.75	8.00	7.00@ 7.50
Heavy lead	4.00@ 4.12½	3.75	3.25@ 3.75
Tea lead	2.00@ 2.25	2.75	2.25@ 2.75
Brass, heavy, yellow	4.50@ 4.75	5.00	5.00@ 5.50
Brass, heavy, red	7.25@ 7.50	8.25	7.25@ 7.75
Brass, light	3.50@ 3.75	4.00	4.50@ 5.00
No. 1 rod-brass turnings	5.25@ 5.50	5.50	5.50@ 6.00
Zinc	2.00@ 2.25	1.50	1.75@ 2.00

TIN PLATES—Charcoal—Bright—Per box:

"AAA" Grade:	New York	Cleveland	Chicago
IC, 14x20	$12.10	$11.95	$11.50
"A" Grade:			
IC, 14x20	9.70	9.90	9.50
Coke Plates—Primes—Per box:			
100-lb., 14x20	6.45	6.10	7.00
Terne Plates—8-lb. Coating—Small lots—Per box:			
IC, 14x20	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.13	$0.16	$0.15
Cotton waste, colored, per lb.	.09½	.12	.12
Wiping cloths, washed, white, per lb.	.13½	38.00 per M	.16
Sal soda, per lb.	.01¾	.02	.02
Roll sulphur, per lb	.028	.03½	.04
Linseed oil, raw, in 1 to 4 bbl. lots, per lb.	.148	.164	.152
Cutting oil, about 25% lard, in 5 gal. cans, per gal.	.65	.60	.65
Machine oil, medium-bodied (55 gal. steel bbl.) per gal.	.33	.36	.24
Belting—Present discounts from list in fair quantities (½ doz. rolls) for leather or rubber:			
Leather—List price, 24c. per lin.ft., per inch of width, for single ply:			
Medium grade	30–10%	30–10%	35%
Med. grade, heavy wgt.	30%	30 –5%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin.ft.:			
First grade	50%	50–10%	50%
Second grade	60%	60– 5%	50–10%

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0325	$0.0325	$0.0325
Cold drawn shafting	per lb.	.034	.034	.035
Brass rods	per lb.	.17	.18	.2125
Solder (½ and ½)	per lb.	.25	.2525	.325
Cotton waste, white	per lb.	.13	.13	.10@.13½
Disks, aluminumoxide mineral, cloth, No. 1 6-in. dia	per 100	4.59	4.59	3.60
Lard cutting oil	per gal.	.65	.75	.75
Machine oil	per gal.	.33	.33	.33
Belting, leather, medium	off list	30–10%	30–10%	30–10%
Machine bolts, up to 1x30 in., full kegs	off list	50–10%*	50–10%*	50–10%*

*List prices as of April 1, 1927

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials — Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
Flint paper*	$6.03	$6.03	$6.03
Emery cloth*	25.87	25.87	25.87
Disks, aluminum oxide mineral, 6 in. dia., No. 1, per 100:			
Paper†	2.61	2.61	2.61
Cloth†	4.59	4.59	4.59
Fire clay, per 100 lb. bag	1.00	.75	.75
Coke, prompt furnace, per net ton	Connellsville,		2.50
Coke, prompt foundry, per net ton	Connellsville,		3.50@4.85
White lead, dry	100 lb. kegs	New York,	13.75
White lead, in oil	100 lb. kegs	New York,	14.25
Red lead, dry	100 lb. kegs	New York,	13.75
Red lead, in oil	100 lb. kegs	New York,	15.25

*Less than 3 reams. †Less than 200.

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

Machine bolts:	
Up to ¾-in. x 6-in., full kegs, list less	60%
Larger, up to 1 x 30-in., full kegs, list less	50–10%
Less than full kegs or case lots, add to list	10%
Fitting-up bolts: list less	45%
Lag screws:	
Up to ½-in. x 6-in., list less	60%
Larger, list less	50–10%
Less than full keg or case lots, add to list	10%
Rivets:	
Structural, round head, full kegs, net	$4.50
Structural, round head, broken kegs, net	6.00
Tank, 7/16-in. dia. and smaller, list less	60%
Nuts:	
Hot pressed, square or hexagonal, blank or tapped:	
Full kegs up to 1-in., incl., list less	60%
Larger, up to 3-in., list less	40–10%
Less than keg or case lots, add to list	10%
Washers:	
Wrought, full kegs, per 100 lb., list less	$4.00
Wrought, broken kegs, per 100 lb., list less	2.00
Turnbuckles:	
With stub ends, list less	20%
Without stub ends, list less	50%
Chain:	
Proof coil, base, per 100 lb., net	$8.50
Cast iron welding flux, per lb., net	.35
Bronzing flux, per lb., net	.50

MACHINE REQUIREMENTS AND INDUSTRIAL CONSTRUCTION

Equipment Wanted

Mass., Boston—Joseph Beal & Co., 465-571 Atlantic Ave.—drills, milling machines, shapers, also modern used lathes.

Mass., Boston — Woodcraft Supply Co., 15 Washington St.—woodworking machinery.

Mich., Detroit — Allied Die Cast Co. of America, 7420 Melville Ave. — buffers and equipment.

Mich., Detroit—Trans-Continental Tool Co., 3658 Superior Ave., manufacturers of tools and light manufacturing—grinder for general use.

Mo., St. Louis—Pauly Jail Building Co., 2215 DeKalb St.—turret head for small bench lathe.

R. I., Providence—City Bd. Contract & Supply, taking bids July 21 for wood and metal working machinery for Jr. High School, Chalkstone Ave.

Opportunities for Future Business

Calif., Ontario—Edison Appliance Co., plans the construction of addition to plant for the manufacture of electric ranges. Estimated cost $1,000,000.

Calif., Redondo Beach—Redondo Beach Union High School Dist., had plans prepared for school shops and gymnasium. Estimated cost $165,000. Allison & Allison, California Reserve Bank Bldg., Los Angeles, Archt.

Conn., New Haven—National Folding Box Co., James St., awarded contract for addition to plant. Estimated cost $40,000.

Conn., Newtown — Fairfield State Hospital Commission, State Capitol, Hartford, will receive bids until July 22, for the construction of a group of buildings for asylum to include garage, carpenter and paint shops, electrical pumping and heating shops, etc. on Mile Hill. Estimated cost $1,750,000. W. P. Crabtree, 410 Asylum St., Hartford, Archt.

Conn., Westport — A. S. Uhler, c/o D. P. Hart, 19 West 44th St., New York, N. Y., Archt., awarded contract for a service garage. Estimated cost to exceed $40,000.

Ia., Algona—City will receive bids until July 15, for the construction of a 34 x 96 ft. maintenance garage.

Ia., Waterloo—J. A. Paulsen, District Engineer Hy. Comn., 603 Marsh-Place Bldg., soon lets contract for a 34 x 110 ft. maintenance garage.

Ill., Chicago—Hess Warming and Ventilating Co., 1207 South Western Ave., had plans prepared for altering and constructing plant addition, 1202 South Western Ave. Estimate $125,000. W. H. Tomlinson, Joliet, Archt.

Ind., Muncie — Warner Gear Co., Muncie, plans the construction of a 2 story, 300 x 400 ft. factory, including power plant and machine shop on Rd. 67, 4 mi. west of here. $500,000. Owner builds by private contract.

Kan., Wichita—Stearman Aircraft Corp., L. Stearman, Pres., 601 East 35th St., awarded contract for the construction of a factory including garage, warehouse, etc. Estimated cost $250,000. Noted June 26.

Mass., Boston — Boston, Worcester and New York Street Railway Co., 210 Newbury St., awarded contract for the construction of a 1 story bus terminal. Estimated cost $50,000.

Mass., Dorchester (sta. Boston) — H. K. Noyes & Son, 857 Commonwealth Ave., Boston, will build a 1 story auto sales and service station, 70 Talbot Ave. Work will be done by separate contracts. Estimated cost $40,000.

Mass., Everett — Merrimac Chemical Co., Chemical Lane, awarded contract for the construction of a 1 story, machine shop. Estimated cost $40,000. Noted June 26.

Mass., Marblehead — Electric Light Dept., awarded contract for 2 story, service building, Commercial St. Estimated $40,000. Noted June 26.

Mass., West Springfield (br. Springfield)—General Motors Trucks Co., 781 Worthington St., awarded contract for a 2 and 3 story, 125 x 175 ft. service garage at Agawam and Connecticut Aves. Estimated cost $125,000. Noted May 15.

Mo., Jefferson City—State Highway Commission of Missouri, c/o T. H. Cutler, Ch. Engr., will receive bids July 21, for the construction of headquarters, garage and record storage building.

N. J., Belleville—Wallace & Tierman Products Co. Inc., 11 Mill St., will soon award contract for a 4 story, 78 x 170 ft. addition to factory for the manufacture of chlorine control apparatus on Schuyler Ave. and Terrace Pl. Estimated cost $150,000. Fletcher-Thompson Inc., 542 Fairfield Ave., Bridgeport, Conn., Archts. and Engrs.

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BUSINESS NEWS DEPARTMENT
Tenth Ave. at 36th St., New York

N. J., Bound Brook — Bakelite Corp., 247 Park Ave., New York, soon lets contract for the construction of a 1, 2 and 3 story factory, to include machine shop and power house on Ruck Rd. and Reading R.R. tracks. Estimated cost $150,000. Francisco & Jacobus, 511 5th Ave., New York, Archts.

N. J., Jersey City — Jersey City Ladder Co. Inc., 677 Montgomery St., architect will take bids about Aug. 1, for construction of 2 story, basement, 45 x 140 ft., factory, foot of Crawford St. Estimate $40,000. B. Singer, 921 Bergen Ave., Archt.

N. Y., Buffalo—Bd. Educ., having plans prepared for the construction of School 64, including manual training dept., etc., Amherst and North Lincoln Blvd. Estimated cost $438,000. D. McNeill, Dun Bldg., Archt.

N. Y., Buffalo—J. H. Williams & Co., 400 Vulcan, are receiving bids for a 1 story addition to plant for the manufacture of drop forge products and machine tools. Estimated cost $50,000.

N. Y., Brooklyn—Bd. of Education, 500 Park Ave., New York, plans addition to school including printing and electric wiring shops, etc. at Ave. S and West 4th St. here. Estimated cost $400,000.

N. Y., Endicott—International Business Machine Corp., awarded contract for remodeling present buildings. Noted June 26.

N. Y., Long Island City—Woodhaven Liberty Realty Co., 565 5th Ave., Brooklyn, will receive bids about Dec. 1, for the construction of a 2 story, 115 x 166 ft. service garage at Rockaway Blvd. and 93rd St. here. Estimated cost $50,000. Private plans. Noted June 26.

N. Y., Syracuse—Pierce, Butler & Pierce, 41 East 42nd St., New York, manufacturers of radiators, hot water heaters, etc., will soon receive bids for rebuilding factory recently destroyed by fire here. Estimated cost $100,000. Private plans.

O., Cincinnati—Weil & Hodesh, c/o Rendigs, Panzer & Martin, Southern Ohio Bank Bldg., Archts., awarded contract for the construction of a 7 story, 100 x 111 ft. garage on 7th St. Estimated cost $200,000. Noted June 19.

O., Cleveland—Cleveland Trencher Co., A. V. Jones, Gen. Mgr., 20100 St. Clair Ave., is having plans prepared for a 1 story, 60 x 90 ft. addition to factory. Estimated cost $40,000. P. Schmidt, 4500 Euclid Ave., Archt.

O., Westerville — Kilgore Mfg. Co., awarded contract for the construction of a 60 x 100 ft. machine shop and 100 x 100 ft. addition to warehouse. Estimated cost $55,000.

Pa., Ambridge—Spang Chalfant Co., Clark Bldg., Pittsburgh, machinists and founders, soon lets contract for the construction of a laboratory on Duss Ave. Private plans.

Pa., Greenville—Chamber of Commerce, c/o J. Dimmick, plans the construction of a 1 story, 60 x 150 ft., manufacturing building. Adelet Mfg. Co., 4610 St. Clair Ave., Cleveland, O., lessee. Architect not selected.

Tenn., Memphis—Union Bus Terminal Corp., Memphis, plans construction 2 story, bus terminals. Estimated cost $250,000. Pickwick-Greyhound Lines, F. B. Archer, district passenger agent and Lone Star Stages, 205 South 2nd St., lessee. A. F. Hanson, Shrine Bldg., Archt.

Wash., Seattle — Ford Motor Co., Dearborn, Mich., plans the construction of and equipment for a new 100 x 320 ft. assembly plant including warehouse, power and oil houses, etc. here. Estimated cost $3,000,000. A. Kahn Inc., 1000 Marquette Bldg., Detroit, Mich., Archt.

Wis., Cedar Grove—R. J. Schwab & Sons Co., Cedar Grove, awarded contract for 1 story, 100 x 175 ft., foundry addition.

Ont., London—Canadian Richards Wilcox Co., awarded contract for construction of a 1 story, 80 x 80 ft., plant addition, to McEachren Constr. Co., London.

Ont., Toronto—University of Toronto, Queens Park, having plans prepared for the construction of a 4 story, basement addition to the mining and metallurgical building. Estimated cost $250,000. Craig, Modell & T. R. London, 96 Bloor St. W., Archts.

Que., East Montreal — Canadian Copper Refiners, Montreal, subsidiary of Nichols Copper Co., Washington St., Long Island City, N. Y., awarded contracts for excavation and steel for a copper refinery here. Estimated cost $2,000,000.